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The Role of Community Participation for Green Stormwater Infrastructure Development

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THE ROLE OF COMMUNITY PARTICIPATION FOR GREEN STORMWATER INFRASTRUCTURE DEVELOPMENT

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ABSTRACT

The primary objective of this research is to understand the role of community participation in green stormwater infrastructure development. Even though the literature affirms the need for community participation to facilitate its implementation, no study in the engineering literature examines this idea with an in-depth, descriptive case study. It is important to understand how technical and non-technical factors interact to promote or hinder its implementation.

This work uses the qualitative case study methodology to fulfil the objective and answer the research questions. The case study is based on the Proctor Creek Watershed, Atlanta Georgia, a rapidly growing urban area located in the southeastern United States. Data sources include participant interviews, documents, and field notes, which are analyzed through deductive coding. The deductive codes are informed by this study's conceptual framework.

Findings reveal that community participation in this case is embedded in collaborative partnership efforts. Also, social conditions highly influence the participation processes by dictating the priorities the community develops during participation processes. Factors such as funding and political support promote green stormwater infrastructure implementation more so than community participation. However, community education addresses the challenge of green stormwater infrastructure perspectives; hence community education plays a role in implementation. These findings affirm existing literature adding to the development of current theories.

DEDICATION

I dedicate this work to my parents, Mervyn and Desarie Barclay. They provided constant love, support and encouragement throughout my formal education, especially at this last stage. I believe that my mother's constant prayers and my father's unwavering confidence in me gave me the determination I needed to complete my Ph.D.

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I am blessed to have an incredible family. Despite the distance, my parents and my sisters, Renee Barclay-Rochester and Kezia Barclay are always just a phone call away for refreshing, encouraging and fun conversations.

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CHAPTER ONE

INTRODUCTION

Background

Growing population combined with rapid worldwide urbanization, both projected to continue significant increase in the future (United Nations, 2014) undoubtedly strains aging and deteriorating urban infrastructure, if that infrastructure exists in the first place. Urban population increases and expanding city limits add more square miles of impervious surfaces highlighting the need for more upgraded stormwater infrastructure systems. Surfaces such as roads, parking lots and building roofs all contribute to the alteration of natural water flows resulting in higher water runoff quantity and impaired runoff quality entering waterways. There is a clear relationship between progressive urbanization of a watershed and increased risk of flooding (Nirupama & Simonovic, 2007; Saghafian et al, 2007). Stormwater pollution poses additional challenges as stormwater runoff becomes a water pollutant when it picks up physical, chemical and biological pollutants before entering waterways (Goonetilleke et al, 2005). Climate change impacts exacerbate these problems associated with urbanization since more frequent and more intense storm events are occurring and expected to continue.

Stormwater management−controlling stormwater runoff quality and quantity with structural and non-structural measures (Marsalek & Chocat, 2002)−requires large and constant investments to maintain (Niemczynowicz, 1999). In cities across the US, the

capacity of current stormwater management systems need to be adapted to meet the demands necessary to sustain good health and quality of life. The capital investment necessary for adapting these systems is well into billions for the next fifty years (Neumann et al., 2014). For example, the city of Atlanta faces startling pecuniary repercussions if they do not address storm water management in the near future. Costs for adaptations of urban drainage could exceed 10 million dollars per year until 2050. To combat the problem of combined sewer overflows that occur when there is excessive flow into sewer systems after heavy rainfall events, the U.S. Environmental Protection Agency (EPA) instituted consent decrees to eliminate combined sewer systems throughout the U.S. This requires billions of dollars in investment for new pipes and equipment alone (ASCE, 2013). A U.S. EPA report (2008) specified that $63.6 billion is needed for combined sewer overflow correction and $42.3 billion for stormwater management. The $42.3 billion stormwater management national costs considers conveyance infrastructure, treatment systems, green stormwater infrastructure and general stormwater management (U.S. EPA, 2008).

There is a disparity of stormwater management strategies and development at an international level; nevertheless, all countries recognize stormwater management as an important environmental issue (Marsalek & Chocat, 2002). Countries such as Australia, Canada and Sweden, are among the most advanced in sustainable stormwater management practices and research. For example, Swedish communities practiced reusing stormwater in news homes as early as 1990s (Niemczynowicz, 1999). In contrast, urban areas of developing countries experience stormwater management problems due to

unplanned development and lack of drainage construction (Butler & Parkinson, 1997; Parkinson & Mark, 2005). Flooding in these areas tends to result in water borne and vector disease outbreaks due to unsanitary conditions.

Urban stormwater management affects the lives of all who reside in urban areas, and necessitates the interaction of technology for infrastructure, environmental policies and public participation. As such, there is a recognized need that its success depends on public engagement through support and participation (Marsalek & Chocat, 2002).

Problem Statement

Considering the need for capital investment in stormwater infrastructure, urban communities across the U.S. are seeking to invest in green stormwater infrastructure as a way to reduce overflows from stormwater and sewer discharges (U.S. EPA, 2008). Green stormwater infrastructure acts as a supplement to traditional stormwater systems, addressing runoff quantity and quality at its source, thus reducing and treating the volume of runoff before it enters traditional systems.

As an emerging technology, several challenges exist as barriers to its implementation, and one such problem is "engendering meaningful participation from multiple stakeholders" (Montalto et al., 2012 p. 1190). By its very nature, green stormwater infrastructure facilitates engagement from a wider range of stakeholders than traditional stormwater infrastructure. And therefore presents an opportunity to capitalize on coordinating participation for project success. In particular, the community is a

stakeholder group that directly experiences the impact of the infrastructure, or lack thereof, as it pertains to their quality of life. Thus, it is worth pursuing in a more guided structure, how community participation plays a role in green stormwater infrastructure planning and implementation.

Research Objectives

The purpose of conducting the case study is to convey a comprehensive understanding of community participation in decisions for green stormwater infrastructure. As such, the primary objective of this research is to study the context, community participation processes, outputs, and implementation for green stormwater infrastructure within the bounds of the selected case, Proctor Creek Watershed in Atlanta Georgia.

To investigate the objectives, this research is guided by the following questions:

1. How do community participation mechanisms facilitate decisions for green stormwater infrastructure?

2. How do context features and community participation processes influence implementation of green stormwater infrastructure solutions?

To answer the research questions, this study applies the qualitative case study methodology to gain an understanding of the role of community participation processes in green stormwater infrastructure planning and implementation. The case is a single study which employs participant interviews and document review. The data analysis is

done by deductive coding, using the attributes in the conceptual framework as a priori codes.

Significance of Study

Researchers recommend that public participation be incorporated into planning and implementation for stormwater systems (Marsalek & Chocat, 2002; Parkinson, 2003; Rauch et al, 2005; Ryan & Brown, 2001). The U.S. EPA (2010) compiled several case studies that examine green infrastructure implementation for stormwater management. However, no study in the engineering literature examines the role of community participation in green stormwater infrastructure development. As green stormwater infrastructure progresses, it is important to understand the factors, both technical and non-technical, that interact to promote or hinder its implementation. Community participation is a non-technical process that can complement or hinder technical processes of planning, design and implementation (Beierle & Cayford, 2002; Priscoli, 2004). Thus, a deeper understanding of its reality for stormwater management can enhance and advance the latter processes. The case study in this work presents a representative case, as cities across the U.S. are increasingly incorporating public participation into green stormwater infrastructure development. Insights uncovered from this research can be transferred to subsequent cases.

Definitions of Terms

For the purpose of this study, community participation is defined as a process whereby the beneficiary – the community, influences decisions for project development that help to enhance their quality of life (Arnstein, 1969; Paul, 1987; Sanoff, 2000). More specifically, the community refers to those who reside in the neighborhoods described in the study. Participation, in its most fundamental definition, according to the Merriam-Webster dictionary, is the action of taking part in something. The words "participation" and "engagement" are synonymous. This offers some explanation as to why the terms community participation and community engagement are sometimes interchanged. Though synonymous, their subtle differences must be recognized. Participation, the term used for this research, differs from engagement in that engagement suggests a more active role and active involvement in the participation process. A community member can participate without actually being engaged. Engagement therefore is a higher level of participation.

For the scope of this research, green stormwater infrastructure refers to engineered stormwater management systems designed to mimic natural hydrological processes (US EPA, 2014). These systems encourage infiltration, evapotranspiration, reuse, and storage of stormwater at its source, to reduce flows into traditional stormwater infrastructure systems.

Research Area

The focus area for this case study is the Proctor Creek Watershed, located in metropolitan Atlanta, Georgia, one of the fastest growing regions in the United States. Atlanta is situated in the southeast United States, along the rapidly developing I-85 corridor. Figure 1.1 shows a topographic map of the watershed area, including its streams and tributaries. There is approximately 34% impervious cover, representing a highly urbanized watershed.

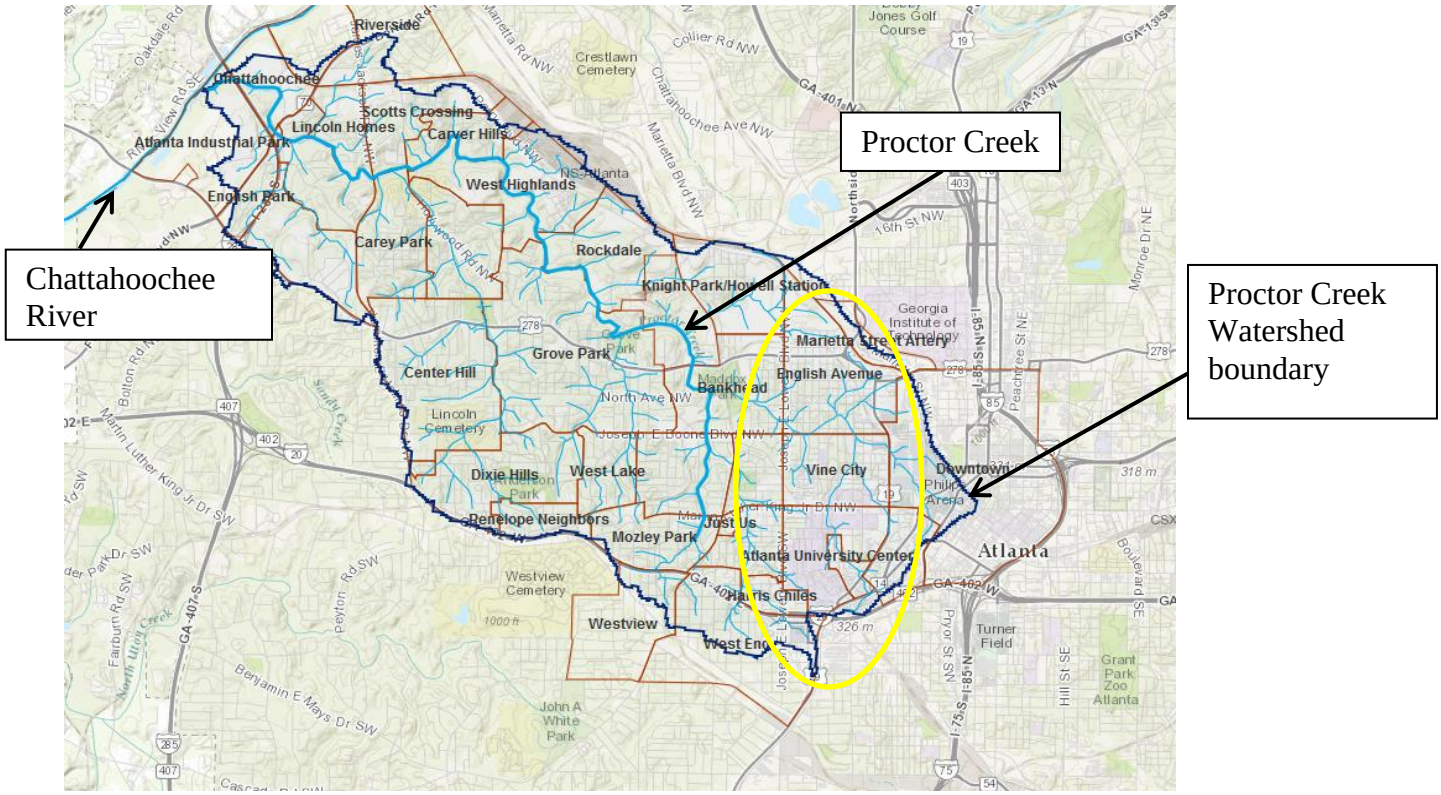

Figure 1.1: Topographic Map of Proctor Creek Watershed (Source: ProctorMap.org)

This study's interviewees and documents reveal that several areas within the watershed's neighborhoods are plagued with impaired water quality, flooding, combined sewer overflows, and other environmental and public health problems. The recurring flooding problem is attributed to increasing development downtown Atlanta and the inadequacy of existing, aging infrastructure to manage stormwater runoff quantity and quality. According to documents reviewed for this case, the recurring flooding issue contributes to further problems such as an increased number of abandoned properties due to mold and mildew, and concerns for public health from polluted flood water.

Even though the city of Atlanta worked towards separating combined sewer systems under a consent decree, there are still problems of sewer spills in the area after heavy rainfall events. Proctor Creek is a nine mile long channel that flows into the Chattahoochee River (Figure 1.1). Hence, activities in Proctor Creek influence water quality and other ecological conditions beyond its watershed boundaries.

There are continuous efforts to restore the creek's ecology in collaboration with the community. The Chattahoochee River Keeper, a nonprofit organization that works to protect the Chattahoochee and its tributaries like Proctor Creek, keeps updated public data on E.coli levels, turbidity, rainfall, and specific conductivity. In addition to this water quality data, there is water quantity data available to the public easily accessible through the Proctor Creek Stewardship Council's website. The group uses the data to hold the City of Atlanta Watershed Department accountable for any sewer spills into the creek. They work alongside the community and community nonprofit organizations to

train citizen scientists who collect data at organized community events. Also, they share the results with the public to inform community members and to give them the needed data to advocate to their elected officials for necessary changes.

In October 2015, the City of Atlanta and the U.S. Army Corps of Engineers partnered to conduct a three year, three million dollar feasibility study for ecological restoration in Proctor Creek. In a speech by Atlanta's mayor Kasim Reed, he mentioned that "this study will survey the water quality, overall environmental quality and flood-damage risk reduction of the Proctor Creek watershed." One of the first community outreach events related to this study was a meeting conducted by the Mobile District of the U.S. Army Corps of Engineers through the Proctor Creek Stewardship Council. Representatives informed community residents and other stakeholders about the study, and then consulted with them for information on the challenges, problems and opportunities in the area.

The community

The population within the 16 square mile watershed is approximately 52,000 spread out in 35 neighborhoods. In this study, particular focus is given to the English Avenue, Vine City and Atlanta University Center neighborhoods (encircled in yellow on Figure 1.1). These areas lie within the Proctor Creek - North Avenue watershed sub-basin. Vine City and English Avenue are immediately downstream of Atlanta University Center, and receive its runoff. These areas, and other neighborhoods in the watershed, are targeted for green stormwater infrastructure projects.

Vine City has a population of 1,499 and English Avenue has a population of 2,707 residents. The neighborhoods have pre-dominantly African-American residents – 87.7% according to the 2010 U.S. Census. Atlanta University Center is an area consisting of four Historically Black Universities including Spelman University, Morehouse University, Morehouse School of Medicine and Clark Atlanta University.

Vine City and English Avenue, have several socioeconomic challenges especially when compared to the City of Atlanta as a whole. These two neighborhoods lie within a single Neighborhood Planning Unit L (NPU L), citizen advisory councils grouped by neighborhoods. Data compiled by Neighborhood Nexus, a regional information system, uses data from the American Community Survey, to group and display data on economic and education data. The data that compares for NPU L and the City of Atlanta with respect to employment rates, income levels and education levels is explained here to give the case its socioeconomic context.

The percentage of individuals in poverty in NPU L is 46.4% compared to 24.2% in the City of Atlanta aggregated neighborhoods. The income per capita in NPU L is $11,989 compared to $35,058 in the city of Atlanta. Median household income is $21, 844 compared to $52,082 in the city of Atlanta. With respect to education, 21% of the population in NPU L has no high school diploma compared to 12.6% in the City of Atlanta. Also, the percentage with a bachelor's degree is 24.8% compared to 46.4% in the City of Atlanta.

Government-Institutional Settings

All levels of government – federal, state and local are actively and directly involved in collaborations and participation processes concerning Proctor Creek watershed. On the federal level, there is the Urban Waters Federal Partnership including ten federal agencies, led by the U.S. Environmental Protection Agency. The partnership also includes twenty eight non-governmental organization and association partners. The goal of the partnership is to work alongside community-led efforts for Proctor Creek's restoration and revitalization. The partnership provides resources and funding for capacity building and community participation processes in line with its goal. A fact sheet about the partnership published by the US EPA (2014a) reports that it aims to:

- Break down federal program silos to promote more efficient and effective use of federal resources through better coordination and targeting of federal investments.
- Recognize and build on local efforts and leadership, by engaging and serving community partners.
- Work with local officials and effective community-based organizations to leverage area resources and stimulate local economies to create local jobs.
- Learn from early and visible victories to fuel long-term action.

The partnership led and continues to lead several projects, including a *Green Infrastructure Technical Assistance* project where the City of Atlanta received fifty thousand dollars "to help expand its use of green stormwater infrastructure into

stormwater management programs." The current outcome is a conceptual design of a green stormwater infrastructure project completed by the city.

Additionally, the City of Atlanta – Atlanta Watershed Department initiated an ordinance in 2013 that requires new development and redevelopment projects to implement green stormwater infrastructure on site. While green stormwater infrastructure is increasing throughout Atlanta because of the ordinance, the ordinance has had much less impact in the Proctor Creek area, due to lack of development there.

Environmental Justice

Organizations and agencies that participate in Proctor Creek projects are grounded in the environmental justice theme. The Urban Waters Federal Partnership program began its work with Proctor Creek after identifying it as an environmental justice community. The EPA Region IV's Office of Sustainability and Environmental Justice is involved with Proctor Creek projects and worked directly on capacity building efforts. One of the community's leading activist organizations, Community Improvement Association, is a community environmental justice organization. West Atlanta Watershed Alliance is a watershed partnership initially formed to address environmental injustices in West Atlanta watersheds, including Proctor Creek watershed. One of Proctor Creek Stewardship Council's underlying values is environmental justice as the organization aims to empower stewards. These groups spur activism among community residents to work together to fight against the injustices that they experienced for decades.

Combined sewers directed the flow of sewage and stormwater from the upstream downtown area into Proctor Creek waterways. While it is natural that water flows to lower elevations, poorer communities downhill received the sewage and stormwater from more affluent upstream communities. The problem intensified as development continued, making the lower income communities bear a disproportional burden for wastewater and stormwater that did not originate from the area. In the early 1990's the city built combined sewer facilities low-lying Proctor Creek neighborhoods to address sewage overflows in the creek after heavy rainfall. Even though these facilities are designed and operate to control sewer spills by temporarily storing excess stormwater then releasing back into the waterways, it was not a wanted technology in the area.

Case study selection

Considering features of the case context previously described, the Proctor Creek watershed case is particularly useful to study the research questions. The case characteristics including urban growth, the ecological conditions, the flooding issue, the socio-economic conditions, and government-institutional context contribute to its suitability for study.

Firstly, as one of the fastest growing metropolitan areas in the U.S., Atlanta's impervious cover is increasing. As such, there is a need for increased stormwater infrastructure maintenance and implementation. Additionally, the ecological conditions call for a greater emphasis on infrastructure that helps to improve water quality within the

watershed boundaries and beyond it. The current push for green stormwater infrastructure implementation in the City of Atlanta is supported by both government and non-governmental organizations, which recognize community participation as an integral component to the development process. Socio-economic conditions in the watershed, which are tied to its issues of environmental injustice, support the priority for community participation while shaping the features of participation process that occurs. The intersection of green stormwater infrastructure development and prioritized community participation is a prime opportunity to study the phenomenon as it occurs in reality. Lastly, the proximity of the case study location allowed the researcher to conduct field visits during the time of study.

Outline of Dissertation

This dissertation is organized into six chapters. Chapter 1 introduces the background of the study, the research problem, the research objective and associated and need for the research, along with the research objectives and questions. Also, the research area is described in this chapter to give context to this research. Chapter 2 gives a review of the literature in urban stormwater management and community participation, followed by this work's conceptual framework. The conceptual framework is developed to guide the research for the single case study. Chapter 3 describes the case study methodology, data analysis techniques and the study limitations. Chapter 4 presents the context findings and discussion. Chapter 5 continues with descriptions of the process, output and

implementation findings and discussions. Chapter 6 concludes this work with the research contributions, implications of the findings, and recommendations for future research.

CHAPTER TWO

LITERTURE REVIEW AND CONCEPTUAL FRAMEWORK

Introduction

This chapter begins with a review of traditional and green stormwater infrastructure controls, and then continues its framing within the context of community participation. The review shows the opportunity to investigate community participation for green stormwater infrastructure development. The chapter advances with the conceptual framework for this study that is shaped primarily by the existing literature in public participation in environmental decision making and collaborative watershed management.

Stormwater Infrastructure

Traditional infrastructure for stormwater management focus on water capacity and conveyance (Kloss, 2008). Despite the efficiency of these when designed well, the adverse effects of urban stormwater can be intensified by traditional stormwater infrastructure systems which often convey runoff directly to streams and rivers (Roy et al., 2008). This physical infrastructure consists of centralized networks of pipes with the main purpose to convey stormwater off site as quickly as possible. In some cities, these pipe networks are thousands of miles long and usually are combined sewers or storm sewers channels. Storage infrastructure holds the water and releases it slowly into waterways, sometimes untreated. These engineered systems were usually the result of

decisions made by engineers themselves without collaboration from the public and other indirect stakeholders, especially since they are highly technical, underground systems.

In contrast with more conventional infrastructure, green infrastructure is a general term for decentralized stormwater management approaches that use low impact development measures by incorporating elements of the hydrological cycle. These elements include interception, evapotranspiration, infiltration, filtration and conveyance, detention, retention and reuse (Kloss, 2008) to treat runoff quality and quantity at the source. Low impact development is an engineering design approach that mimics the pre-development hydrological function of the land (Dietz, 2007).

The meaning of green infrastructure varies with context (Benedict & McMahon, 2006) and scale. The term "green infrastructure" is an umbrella term that includes a range of strategies that can be applied on different scales throughout a watershed for overall management. Scales include the city scale or regional scale, and the neighborhood or site scale. At a city or regional scale, green infrastructure is a network of undeveloped natural areas that provides environmental benefits such as flood protection, cleaner water, cleaner air, and biodiversity maintenance (US EPA, 2014). Land conservation efforts exemplify this idea–natural areas around urban areas can serve not only environmental protection, but recreational use as well (US EPA, 2014). At the neighborhood or site scale, green infrastructure refers to stormwater management systems that allow infiltration and storage of runoff at its source (US EPA, 2014). At this scale, the term "green stormwater infrastructure" can be used, and is employed for the scope of this

research. Examples at this scale include rainwater harvesting where water is collected and stored for use, raingardens, permeable pavements, green roofs and bioswales.

No matter the scale of use and implementation, for best performance of a stormwater system in an urban watershed, there needs to be widespread implementation of green infrastructure (Montalto et al., 2012). Best management practices for stormwater management encourage increased use of green stormwater infrastructure measures to supplement traditional infrastructure. These best management practices are being adopted in cities across the U.S. to combat the problem of combined sewer overflows.

Benefits of Using Green stormwater infrastructure

In 2009, the city of Philadelphia Watershed Department conducted a study to understand the triple bottom line benefit of options between traditional and green stormwater infrastructure to control CSO events. The study, and subsequent real-world projects, illustrated that using green stormwater infrastructure approaches gave way to social, environmental, and economic benefits that traditional infrastructure could not provide (Stratus Consulting Inc., 2009). Some environmental benefits of green stormwater infrastructure include flood protection, reduction in sewer overflow events, and efficient land use. An example of a social benefit is enhanced livability through attractive streetscapes. Lastly, some economic benefits include increases in land value, reduction in the cost of traditional infrastructure, and encouragement of economic development (U.S. EPA, 2010).

Twelve cases on green infrastructure compiled and analyzed by the U.S. EPA (2010) revealed some common policies used to advance implementation. These included stormwater regulation, stormwater fees, demonstration and pilot projects, and review and revise local codes. The motivation for these was not only stormwater management innovation, but the benefits that green infrastructure provided. In addition, it adds value through its provision of direct experience with natural ecosystems, physical recreation, environmental education, and opportunities for social interaction (Ahern, 2007). For example, the Baldwin Park Community in Orlando, Florida uses an underground stormwater system that is integrated with restored wetlands. It has aesthetic and recreational benefits in addition to enhanced water quality benefits (WERF, 2009).

Cities are increasingly including green stormwater infrastructure in their stormwater management plans to capture and reuse stormwater as the benefits are continually being recognized (U.S. EPA, 2008). Reusing stormwater is already explored and implemented in other developed countries such as Australia, and now increasingly in the U.S. to help lessen the demand on water supply systems. For instance, collected water is reused for irrigation and other non-potable uses. Additionally, stormwater utilities recognize that green stormwater infrastructure can be incorporated into stormwater management plans to help address regulations, requirements and ordinances (Kloss, 2008), and at the same time reduce costs on stormwater infrastructure. Since green stormwater infrastructure measures are often less costly than traditional controls, combining both methods can reduce overall cost of the infrastructure system while addressing problems such as flooding and combined sewer overflows (US EPA, 2014b).

Green Stormwater Infrastructure Implementation Challenges

Even though the body of knowledge on best management practices and the design of green stormwater infrastructure increased significantly over the last decade, there are several difficulties with its implementation. Some barriers include insufficient engineering standards and guidelines, lack of institutional capacity, limitation of funding and resistance to change (Keeley et al., 2013; Roy et al., 2008). For example, financial issues can be addressed in part by the addition of fee acceptance or increase, but this may be unfeasible in some cases (Keeley et al., 2013). Local municipalities lack data on the technology's performance and are more resistant to adopting the technology.

These problems are progressively addressed with current research and practice. For instance, to address resistance to change, one solution Roy et al. (2008) gives is to educate and engage the community. Several cities across the U.S., such as Philadelphia and New York City, make engagement and education an integral part of watershed planning efforts to advance green stormwater infrastructure.

Community Participation in Infrastructure Projects

As the community participation literature emerged in the latter half of the twentieth century, development projects in both the developing and developed world emphasized the community participation concept. While the Western-funded projects in developing nations emphasized community participation in urban housing, health, and population (Paul, 1987), so too did public projects in the West. U.S. federal agencies such as the Environmental Protection Agency, the U.S. Army Corps of Engineers, and the

Federal Highway Administration encouraged community participation and engagement by incorporating it into project planning. Despite the emphasis, the amount of community participation actually practiced effectively was very much debatable.

Community participation is increasingly recognized as a way to incorporate sustainability into infrastructure projects (Flora, 2004). For example, the Envision rating system−a sustainability assessment framework for infrastructure−evaluates project leadership through rewarding collaboration and provision for stakeholder involvement among other factors. The community is one such stakeholder group. The concept of community participation relates to social sustainability as it considers the interaction of society and infrastructure for long term benefits.

Advantages and Disadvantages of Community Participation

The literature affirms the advantages of public participation (Creighton, 2005; Duram & Brown, 1999; Forester, 2006; Reed, 2008). Benefits associated with public participation include better informed decisions, increased acceptance of decisions, social learning, and enhanced democracy (Mostert, 2003). Additionally, the process builds social capital, generates increased levels of trust, increases ownership and generates information and understanding (Brody, Godschalk, & Burby, 2003; Burby, 2003).

The public is a source of information that can contribute to quality decisions through possibly influencing more "technically rigorous" decisions that satisfy a broader range of interests (Beierle, 1999 p. 84). This can be attributed to participants contributing local knowledge, which can "include information pertaining to local contexts or settings,

including knowledge of specific characteristics, circumstances, events, and relationships, as well as important understandings of their meaning" (Corburn, 2003 p. 421). Brody, Godschalk, & Burby (2003) believe meaningful involvement comes about through inserting this local community knowledge early in the planning process.

On the other hand, problems such as inadequate and unrepresentative response, inconsistent decision making, costs and time plague the participation process (Luyet, Schlaepfer, Parlange, & Buttler, 2012; Mostert, 2003; Reed, 2008). Also, poor quality of community input fails to reflect community needs accurately (Arnstein, 1969). Concerning inadequate and unrepresentative response, Laurian (2004) identified that sociodemographic factors, such as lower household incomes, decreased the likelihood of participation; whereas individual motivation, distrust in public agencies, integration in local social networks, increased the likelihood of participation. In addition, citizens are likely to participate in a collaborative process if they believe that the process can help to enhance quality of life for the public (Samuelson et al., 2005).

Defining Community Participation

Though widely studied, the literature does not converge on a single definition of participation. Several definitions exist (Creighton, 2005; IAP2, 2014; Innes & Booher, 2004) and each depends on the context it is used in and the decision making processes (Luyet et al., 2012).

Arnstein (1969 p. 216) associates the term citizen participation with citizen power. Participation involves deliberately including the "have-not citizens" in influencing

future outcomes that affect them, thereby allowing power that they would not usually have. Within the context of infrastructure development in developing communities, (Paul, 1987 p. 2) defines community participation as "an active process by which the beneficiary/client groups influence the direction and execution of a development project with a view to enhancing their well-being in terms of income, personal growth, self-reliance or other values they wish to cherish." He describes the objectives of community participation to include empowerment, capacity building, increased project effectiveness, project cost sharing and improvement of project efficiency.

According to (Sanoff, 2000) community participation is "direct public involvement in decision-making processes whereby people share in social decisions that determine the quality and direction of their lives." He also continues with the main purposes of participation (p. 9):

- To involve people in design decision making processes and as a result, increase their trust and confidence in organizations, making it more likely that they will accept decisions and plans and work within the established systems when seeking solutions to problems.
- To provide people with a voice in design and decision making in order to improve plans, decisions, and service delivery.
- To promote a sense of community by bringing people together who share common goals.

Innes & Booher (2004) introduce the term "collaborative participation" as a new framing on public participation that goes beyond traditional participation methods. While

traditional participation still has its place, collaborative participation takes on a multiple interactions among stakeholders rather than the traditional two-way interaction between citizens and government (Innes & Booher, 2004). The authors state that participation has several purposes, including leveraging local knowledge and impartiality; however, it is mostly observed because it is required by law in some settings.

Levels of Participation and Mechanisms

There are several known mechanisms to facilitate community participation. These include visioning, charrettes, community action planning, participatory action research, workshops, and strategic planning (Sanoff, 2000). These methods can be chosen to adapt to the community, the issue to be addressed, and the facilitator's experience. A survey of public managers' perceptions about public participation found that cities commonly use traditional forms of participation such as public hearings, citizen advisory boards, and community or neighborhood meetings (Wang, 2001) which are significantly effective for meeting various dimensions of participation. However, theoretical definitions of participation are achieved through a limited number of participation methods in practice (Beierle, 1999).

Different levels of participation are appropriate for different stages and types of projects. Nonetheless, there is more impact for beneficiaries from participation the higher the level of participation. The levels of participation as described by the International Association for Public Participation (IAP2) are shown in the diagram below (Figure 2.1).

From left to right in Figure 2.1 there is increasing impacts of participation. Thus, there is most impact when the public is empowered with decision making.

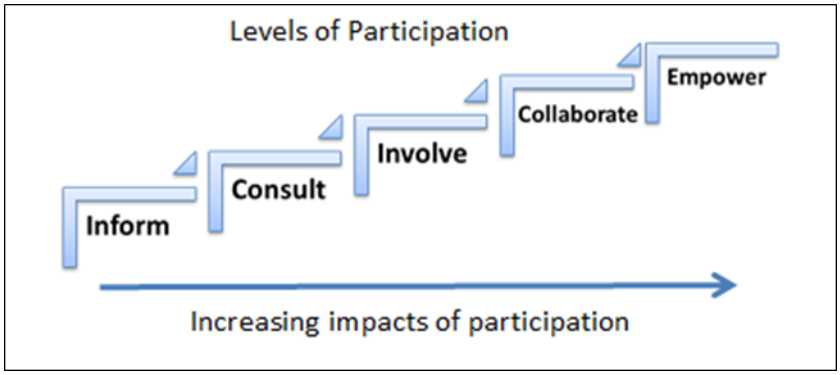

Figure 2.1: Increasing Impacts of Participation (adapted from the International Association for Public Participation, Public Participation Spectrum (IAP2, 2014))

Informing the public is the base level of participation where the public is simply given information about the proposed project (IAP2, 2014). Examples of mechanisms for public participation at this level include the media, brochures, the internet, public meetings and hearings (Beierle & Cayford, 2002; Mostert, 2003). Consulting occurs when there is an exchange of giving information to the public and receiving feedback to be considered (IAP2, 2014). Examples of mechanisms include public meetings, interviews and internet discussions (Mostert, 2003). The informed and consulted participants are less powerless to change any course of action that may affect them.

Involving the public establishes a level of understanding of their concerns and contributions. Collaboration involves the public in every aspect of the decision making process. This approach builds consensus among stakeholders and the public for complex problems (Margerum, 2011). Lastly, empowerment is giving the public the opportunity to

make the final decisions. Involving, collaborating with and empowering the public can be done through small group meetings such as design charrettes and workshops (Mostert, 2003), and interacting with key persons (Samuelson et al., 2005).

Following the theoretical definition of participation, meaningful participation truly occurs at higher levels of participation, especially since this is when benefits of public participation can be recognized (Mostert, 2003). Base levels of participation are sometimes considered to be non-genuine forms of participation (Arnstein, 1969). According to the goals of the participation process, informing the public is the essential foundation of participation but should only build from there, not end there.

Results of a survey by (Wang, 2001) found significant influence of participation in decision making for consensus building and identifying and assessing public needs, but still participation is very limited in decision making. This limitation shows the lack of depth in the participatory process which may undercut some of the purposes and advances it tries to achieve.

Green Stormwater Infrastructure and Community Participation

Public participation is particularly important in decision making for water and environmental issues (Beierle, 1999; Priscoli, 2004) and can lead to more sustainable water management (Mostert, 2003). Beierle (1999) recognizes that differing perspectives between the public and experts can be complementary in decision making. Nonetheless, for participation to be effective in water and environmental issues, other aspects of

decision making such as technical and scientific contexts must be in proper balance with participation (Beierle, 1999).

Priscoli (2004) describes public participation in water management as an ethical issue of informed consent; it occurs when solutions are not simply given by engineers, but facilitated by them, with collaboration from the public. This interaction constitutes meaningful participation; public participants experience the "burdens" of making choices as opposed to simply being the recipient of decisions (Priscoli, 2004). Thus, meaningful participation can only begin when participants understand their part in the process, the goals to be accomplished, and how they can contribute.

Green stormwater infrastructure is a decentralized approach to stormwater management within a watershed, whereas traditional stormwater infrastructure is centralized. With the shift to complement centralized systems with more decentralized systems, there is also a parallel with the disciplines involved with stormwater management. It is no longer solely the engineer's job to deal with these issues, but it is now an interdisciplinary field involving technical experts such as ecologists, soil scientists, planners, designers, hydrologists and engineers (Randolph, 2012), members of the public, governmental and non-governmental groups. This necessitates collaboration among these groups; and collaboration underpins principles of public participation processes. Sabatier et al. (2005) recognizes that decision making for watershed management is now collaborative, where problem solving is approached by diverse stakeholders to build consensus and produce results (Margerum, 2011).

Public participation has been widely studied for water resources management and collaborative watershed management (Benson et al, 2014; Koehler & Koontz, 2007; Leach, Pelkey, & Sabatier, 2002; Samuelson et al., 2005; Webler & Tuler, 2001). Green stormwater infrastructure lays at the intersection of these fields, yet participation in its project development and implementation has not been investigated in the literature. Countries like Germany and Australia are more advanced in urban stormwater management than the U.S. and have considered the integrated approaches and public involvement for storm drainage and runoff quality (Rauch et al., 2005; Ryan & Brown, 2001). Now, cities like Philadelphia and New York City continue to highlight the need for community involvement for stormwater management. As such, this development necessitates a deeper understanding of the interaction between participation and green stormwater infrastructure development. The connection between participation and infrastructure decisions should be more apparent as green stormwater infrastructure becomes more prevalent in urban areas across the U.S.

Conceptual Framework

The conceptual framework continues with the review of the literature to guide its development. This framework guided the field research and informed the data analysis. Its development began from the onset of the study and continued to evolve as the research progressed. It was developed through several iterations and is based on theories found in literature that cover collaborative watershed management and public participation. In addition, iterations among literature reviews, data collection and

preliminary data analysis informed this framework. It is used to understand, describe, and examine the context, participation processes, outputs, and implementation for green stormwater infrastructure, in the Proctor Creek Watershed in Atlanta, Georgia.

In this section, the conceptual framework is represented in both narrative and illustrative forms to highlight and explain the main themes, attributes, and ideas (Miles, Huberman, & Saldana, 2014) that occur in this study. Each element of the conceptual framework is described to set the bounds of the case.

Process of developing the conceptual framework

Framework development began with causal loop diagrams to show the interrelationships among themes and elements found in public participation and engineering literature on stormwater runoff quantity and quality. However, further development sought the need to extend the theoretical basis of participation.

The conceptual framework for this study draws on the framework proposed by Sabatier et al. (2005) shown in Figure 2.2, and Beierle & Cayford's (2002) conceptual model of public participation. The data in this case study revealed similar attributes to these pre-existing frameworks; thus, it was appropriate to use them after examining the literature. During the study, it was found that community participation was bolstered within the context of collaborative approaches. Recognizing this helped to frame and to understand community participation as it was occurring in reality.

Aspects of Sabatier et al.'s (2005) framework were evaluated (Leach & Sabatier, 2005; Samuelson et al., 2005) and used to construct a public participation evaluation

framework (Benson et al., 2014). Subsequent works in collaborative approaches to watershed management went beyond measuring process outcomes as Sabatier et al.'s (2005) work did, to address implementation and environmental outcomes (Koontz & Newig, 2014; Koontz & Thomas, 2006). Beierle & Cayford's (2002) framework was developed to examine public participation in a large number of heterogeneous case studies. It included context, process, and results categories, along with their respective attributes. The framework was detailed, yet remained sufficiently general to evaluate a range of case studies.

Sabatier et al.'s (2005) framework explains the success of collaborative watershed partnerships in terms of themes including context, process, civic community, policy outputs and watershed outcomes, most of which are applicable to this study. This work recognizes community participation as a key aspect of collaborative approaches. It goes beyond the successful collaborative watershed management framework, and studies participation as it happens beyond the collaborative watershed partnerships. While the collaboration aspect is heavily incorporated in this study, it extends to include, for example, information flows to the community about the issue, how the community is involved and consulted, and how the community is empowered to make decisions towards their well-being. This addresses the limitation that “it is not very general” by virtue of its design and purpose (Sabatier et al., 2005 p. 173).

While this work adapts the focus, it applies most of the themes depicted in Figure 2.2. The context theme wholly applies to this case because it situates and begins to delineate the boundaries of the case study. It is imperative to understand all the attributes

listed within this theme because it helps to further draw connections among other themes later in the study. In addition, as a part of the context, the type of issue (Beierle & Cayford, 2002) is included to fully describe the Proctor Creek case study. The civic community theme shown in the model below is relevant to this study; however, its attributes are described within the civic community conditions for this study as opposed to a stand-alone variable as shown in Figure 2.2.

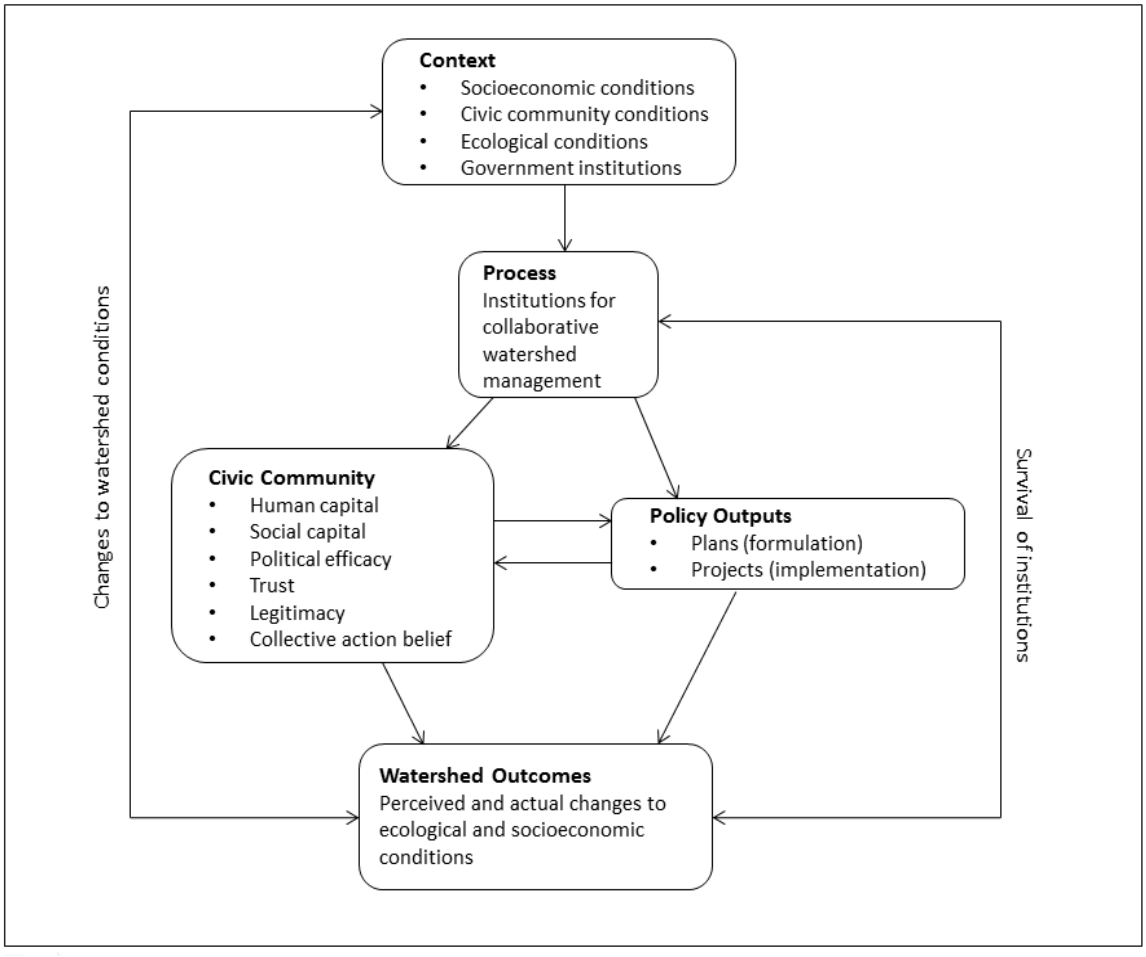

Figure 2.2: A Conceptual Framework for Collaborative Watershed Management. (Sabatier et al. 2005)

To supplement Sabatier's process theme, this work employs Beierle & Cayford's (2002) process theme that includes the type of mechanisms and the respective characteristics, and other process features such as participants' motivation and issues of non-participation. The detail that Beierle & Cayford's (2002) framework entails is more relevant to the case of Proctor Creek watershed. It provides a basis to answer the research questions more directly than the process theme of Sabatier's framework. Both Sabatier et al. (2005) and Beierle & Cayford (2002) describe the output theme as recorded decisions in plans and documents, a measure which is used in this study.

This work extends Beierle & Cayford (2002) conceptual framework, with the addition of the implementation theme. This theme is considered for this work especially since there is community participation in the implementation processes for this case. Also, as a single case study, the implementation theme gives a fuller description of the case in its entirety. This research aims to investigate and draw connections between themes of context, community participation processes, and the outputs for implementation of green stormwater infrastructure. While doing so, it acknowledges that the literature warns against drawing causal connections between participation and successful implementation (Beierle & Cayford, 2002) since there are multiple, complex factors that play into the role of implementation, specifically infrastructure implementation.

Framework Description

Theme 1: Context

The literature makes it clear that context factors are necessary for understanding processes and outputs (Brody, 2003; Luyet et al., 2012; Tang & Brody, 2009). This framework includes elements of the context theme that both Sabatier et al. (2005) and Beierle & Cayford (2002) describe. The context elements include the type of issue, the socio-economic conditions, the ecological conditions, the civic community conditions, and the institutional settings that surround the case. Context can include many more elements than outlined here for this case (Beierle & Cayford, 2002); but, preliminary emergent findings and their theoretical parallels were considered, and the most prominent issues that are relevant for Proctor Creek are described.

The Type of Issue

The type of issue describes the case situation and its characteristics. It delineates the case as an issue of watershed-scale natural resource management, as stormwater management is increasingly considered as such (Roy et al., 2008). The overarching goal in efforts concerning Proctor Creek watershed, this work's research area focus, is watershed restoration and remediation for water quality improvement. As the headwaters for the Chattahoochee River, it is imperative that activities which impose negative downstream impacts be addressed.

Defining even further, the issue for this case concerns addressing the lack of efficient stormwater infrastructure that contributes to the reoccurring flooding problem.

Green stormwater infrastructure has similar processes for planning, design and implementation as other types of civil infrastructure such as roads and buildings (Benedict & McMahon, 2006) which tend to lend itself to decision processes led by solely technical professionals. Understanding the type of issue and its relation to participation and green stormwater infrastructure development can contribute to an understanding of how non-technical benefactors can contribute to technical decision making processes.

Ecological Conditions

Within urban watersheds, ecological conditions can give insight into infrastructure planning and design (Grimm, Grove, Pickett, & Redman, 2000; Pickett et al., 1997), especially for water infrastructure. The "urban stream syndrome" characterized by features such as high nutrient concentrations and low biotic diversity (Grimm et al., 2008), can be used to describe many urban streams including Proctor Creek, that have been affected by increased pollutant loading, stemming from the effects of urbanization and increasing impervious cover. Ecologically-based designs can be considered to counter this urban stream syndrome. For instance, low-impact stormwater solutions and water capture systems can be used for urban stormwater management (Grimm et al., 2008). Conversely, storm water infrastructure may influence ecological structures and processes. For example, storm drains and pipes can influence insect distribution on household or neighborhood scales (Grimm et al., 2008). Thus, it is important to

understand decisions for the built environment within the limits of the natural systems and as drivers for changes that occur within it.

Beyond the natural characteristics of ecological systems, is the human element of the system, which introduces far more interrelated factors to consider (Pickett et al., 1997). An ecosystem's structure, function, and processes are influenced by human activity such as land use and development, as well as social processes. The influence of human activity on ecosystems convey the need to understand issues that arise such as environmental justice (Grimm et al., 2000).

Socioeconomic Conditions

Socioeconomic conditions describe the general income levels, education status, and occupations in the case community. One study by Laurian, (2004) found that financial resources is an indicator of public participation in environmental decisions; higher income earners participated much more than low-income earners. In addition, the same study found that education level and employment status of respondents had no significant effect on participation. Similarly, Tang & Brody (2009) found that context factors such as wealth and education have an influence on plan quality, though not statistically significant. The case study area's socioeconomic conditions and its influence on community participation is explored and compared with the theoretical findings.

Civic Community Conditions

The civic community conditions attribute is described by pre-existing relationships (Beierle & Cayford, 2002) and human, social and political capitals (Flora, 2004). Civic community conditions identify issues of conflict, and levels of trust among community participants towards other community participants, government agencies, organizations and other stakeholders in the participation processes of the case (Sabatier et al., 2005). For many years, numerous groups, organizations, and institutions have been working in the Proctor Creek area for revitalization and restoration efforts, some more consistent and long-standing than others. Considering these groups' involvement, gives reason to investigate the community's response and relationship to all these stakeholders.

Margerum (2011) asserts that one reason that collaboration emerged is due to the lack of trust in government that created conflict in planning efforts. This conflict is usually a result of delayed community interaction for decisions and communication barriers. An understanding of these issues can lead to participants having more prospects for decision-making roles in collaborative processes (Margerum, 2011).

Government-Institutional Settings

This element of the context theme describes the levels of government involved in Proctor Creek efforts and their roles, their levels of involvement and the identity of the lead agency (Beierle & Cayford, 2002). Leach & Pelkey (2001) found that agency involvement can be a contributing factor to successful watershed partnerships, especially

when agencies have sufficient resources for participants to be actively involved in partnership processes.

Theme 2: Process

Community Participation and Collaboration

Collaboration is one of the higher levels of community participation concerned with building consensus among stakeholders who are part of the participation process (Margerum, 2011). Here, we look at how the process of community participation occurs in reality, and consider how collaboration occurs between the community and other stakeholders at various stages of the planning processes. The levels of participation, mechanisms and characteristics are explored to understand the planning process that influences decisions for implementation stormwater infrastructure in this case.

Type of Mechanism and Characteristics

The types of participation mechanisms were mentioned previously in the literature review and are studied according to the following characteristics (Beierle & Cayford, 2002):

- Type of mechanism and levels of participation
- Description of participants
- Type of output
- Goal of process

Motivation for participation and Issues of non-participation

Individual motivation is a key factor that determines community participation (Laurian, 2004). Motivation looks at the factors such as participants' interests in the issues, if participants can be paid for their time (Irvin & Stansbury, 2004), and commitment levels to the area (Laurian, 2004). For instance, many residents in Proctor Creek watershed neighborhoods are renters, not home owners – which may affect participation levels. In addition, the perception of influence on the output and outcomes can be a motivating factor in participation processes (Beierle & Cayford, 2002).

Laurian (2004) revealed several reasons for non-participation in environmental decision-making including trust in government agencies and passivity towards the issue. The same study found that less common reasons for non-participation were "planning to move from the area" and "lack of interest" (p. 62). It is important to understand non-participation in order to increase efficiency of future participation efforts.

Education and Capacity Building

This attribute explores how the community learns about the issues and how available resources are used to build the community's ability to address the issues through participation. It is difficult to attain meaningful participation (Margerum, 2011); educating and capacity building contribute to more meaningful participation by ensuring residents are equipped to make, contribute to, and support better decisions.

Education on stormwater management and infrastructure can help reduce community resistance to sustainable stormwater systems like green stormwater

infrastructure (Montalto et al., 2012; Roy et al., 2008) especially in urban areas. For example, demonstration projects can help increase the community's understanding of green stormwater infrastructure, thus increasing support for implementation throughout a watershed. The education the community receives should go beyond understanding the scientific underpinnings of an issue to establishing an understanding of alternatives for various solutions and the associated outcomes (Beierle, 1999). Education should not only be directed towards the community; but it should also include members of the community educating their government representatives about the issues that affect the community to allow for informed input about potential solutions. Education in this sense should equip community members to apply pressure to those who have authority to effect and enforce necessary changes.

Capacity is considered in terms of ability (Beierle & Cayford, 2002), collective resources, and human and social capital to solve problems within the community (Chaskin, 2001). Capacity building is a process that includes strategies such as "leadership development, organizational development, community organizing, and fostering collaborative relations among organizations" (Chaskin, 2001 p. 299).

Theme 3: Output

Plans, documents, and reports

Outputs are decisions from the participation processes reflected in documents, reports, project plans, and the projects themselves (Koontz & Thomas, 2006). Beierle &

Cayford (2002) propose that the quality of the output can be evaluated by whether public values are incorporated into decisions and if the quality of decisions improves as a result of participation efforts. For instance, decision quality can be improved by incorporating local knowledge of the problem and ideas for alternative solutions from the community. These social evaluation goals help to determine the effectiveness of participatory mechanisms by goals such as identifying their strengths and weaknesses, and also help to determine ways to improve mechanisms (Beierle, 1999). The outputs of this work focuses on those decisions directly related to stormwater infrastructure planning, design and construction.

Theme 4: Implementation

Implementation is defined in five stages, as described by Table 2.1. While the study describes the successful completion of a project for this case, it is cautious to consider the insights to success as it relates to participation (Beierle & Cayford, 2002).

Table 2.1: Stages of Implementation (Beierle & Cayford, 2002)

Stage	Process
1	Output of the public participation process
2	Design or commitment on the part of the lead agency
3	Changes in law, regulation, or policy
4	Actions taken on the ground
5	Changes in environmental quality

This work considers the stages of implementation, the likelihood of implementation, and describes some the factors presupposing implementation other than participation (Beierle & Cayford, 2002). Though decision-making processes are intended to include participation processes, more factors ought to be considered. For example, external partnerships may accelerate and stimulate actions that improve water quality through green stormwater infrastructure. Without partnerships, progress may be much slower and under-resourced. Also, within the planning process many complexities hinder implementation (Loh, 2012). Loh (2012) suggests that these complexities in the planning process are likely to occur at four points−including visioning, plan writing, local government actions, and ordinance enforcement. This research describes the factors that emerge from the data as it aligns or misaligns with existing theory.

Outcomes reveal the effects of implementation but are much more difficult to measure than outputs, decisions from participation processes (Koontz & Thomas, 2006). Perceived and projected outcomes include stormwater control objectives as it relates to the performance of the implemented infrastructure. The scope of this work does not include data for performance of implemented systems. However, it is necessary to state that performance goals are determined by whether stormwater control objectives are met or not. These objectives are as follows (*Design of Urban Stormwater Controls*, 2012 p. 37-38):

1. Minimization of runoff
2. Implementation of source controls at point where precipitation reaches the ground
3. Resource protection

4. Protection of public safety, health, and welfare
5. Protection of infrastructure and public property
6. Technical feasibility and costs, practicality, public acceptance

To summarize the conceptual framework used for this study, Figure 2.3 shows the theoretical constructs that guide this work.

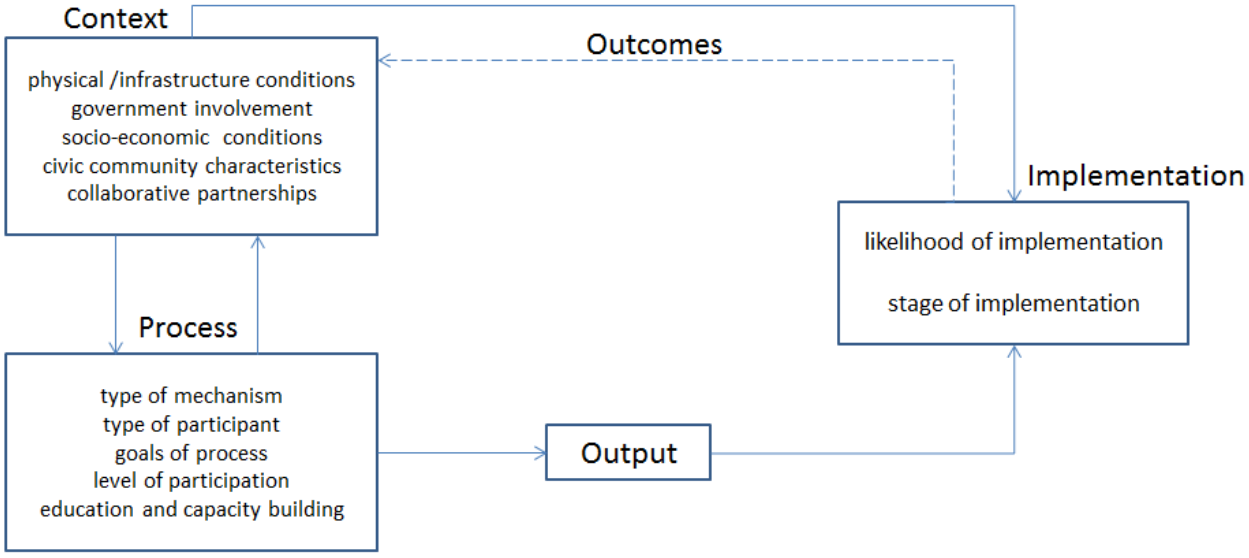

Figure 2.3: The interacting themes and attributes represent the case study for community participation for green stormwater infrastructure

Research Objective

Considering the framework, the objectives of this research are to:

1. Investigate how community participation influences decisions for green stormwater infrastructure.
2. Understand the case context, participation processes, outputs, and implementation for green stormwater infrastructure development.

To fulfill these objectives, the following research questions guide the study. The questions are as follows:

1. How do community participation mechanisms facilitate decisions for green stormwater infrastructure?
2. How do context features and community participation processes influence implementation of green stormwater infrastructure solutions?

These questions were revised during the data collection and data analysis as the case study progressed. Originally, the research questions focused on the participation process only – the mechanisms that facilitated community participation in stormwater infrastructure design decisions, not factoring in the influence of context, implementation, and possible outcomes. During data collection, it was determined that this was a limited scope due to the lack of events focused on stormwater infrastructure and green stormwater infrastructure alone for the selected case study. The researcher attended several events and observed that most of the events were generally about a collection of

issues in Proctor Creek, not just stormwater management. Also, the design process for new green stormwater infrastructure projects is set to occur beyond the time span of this study, later than originally planned by the relevant authorities. Hence, the influence of community participation on decisions could not be directly studied for the engineering design process. Though implemented projects are limited, the detail of the implemented project is worth including and analyzing to understand the perspective of the entire situation for green stormwater infrastructure in Proctor Creek. Considering that this study pursued a single case, the focus expanded beyond the participation process to understand how context plays a role in participation processes and how infrastructure implementation processes are influenced and carried out.

Chapter Summary

In this chapter, I presented the literature review followed by the conceptual framework in narrative and illustrative forms. This framework was based on several iterations of literature reviews, preliminary analysis of interview transcripts and documents pertinent to this study. I described theoretical constructs that make up the framework including themes from collaborative watershed management and public participation in environmental decision making. The study's conceptual framework included the context, process, output, and implementation themes.

CHAPTER THREE

CASE STUDY RESEARCH METHODOLOGY

Introduction and Overview

This research uses the qualitative case study methodology to examine a single case. This case study centers on green stormwater infrastructure development in Proctor Creek Watershed, Atlanta Georgia and examines the context, process, outputs, and implementation. The context itself, as previously described in the conceptual framework, delineates the case and highlights the boundaries that are adhered to for the study.

The purpose of this case study is to convey a comprehensive understanding of community participation in decisions for green stormwater infrastructure to answer the research questions. The overarching query guiding this research is the role of community participation in green stormwater infrastructure planning and implementation. This study draws on data collected through interviews, documents, and field notes from (Creswell, 2013; Yin, 2009) to answer the research questions.

In this chapter, I start with a description of the case study methodology. I continue with descriptions of data collection methods, the data analysis approach, and the limitations and challenges of conducting this case study research. I describe the project area and case selection, the interview participant selection, and gaining access to the research area and the participants. In addition, I explain the ethical considerations, validity and reliability relevant to this study.

Considerations for choosing the case study method

After conducting a review of community participation and stormwater management, the preliminary research questions were derived. The Proctor Creek case study was identified through meetings and conversations with employees primarily from the United States Environmental Protection Agency who introduced Proctor Creek as one of the watersheds within the Urban Waters Federal Partnership (UWFP) program. This program focuses on providing resources for revitalization and restoration of urban waterways. At the time this study was considered, the Proctor Creek watershed was one of the most recent watersheds to be a part of the program. The study was determined to be relevant, due to the preeminence of the issue and the expanding green stormwater infrastructure applications to help solve some of the stormwater management problems plaguing some neighborhoods in the watershed.

Only one case study was conducted in order to allow time for a full and detailed review from context to implementation within the boundaries of the case. The case study method provides the advantage of examining component parts, process, and interrelationships. For this research, conducting multiple case studies was considered to be unfeasible primarily due to limits to adequate data sources, time constraints and proximity of case study sites. Preliminary data collection through gathering and screening existing public documents about Proctor Creek confirmed the suitability of the case. In addition, this case reflects similar situations in urban areas in the U.S. As the literature review described, many urban areas are adopting green stormwater infrastructure strategies to help manage stormwater. Lessons learned from this case can inform the use

of community participation for green stormwater infrastructure in urban areas across the U.S.

Choice of Methodology

The questions guiding this research seek explanations of *how* context and community participation impact decisions and implementation. The goal is to understand the issue, explore what the circumstances of the study are as they happen, and draw connections to learn from the study. The type of questions and the goal of the research favored the case study methodology to appropriately answer the research questions. Specifically, community participation is a social complexity that requires in-depth description within the bounds of this case. Also, the events that occur within the bounds of the case cannot be controlled or manipulated, and these events happen in real time. Hence the suitability of the case study method as opposed to more experimental approaches (Yin, 2009).

Qualitative research seeks to understand the subject in depth by leveraging human perception and interpretation of their experiences (Merriam, 2009; Stake, 2010). For this study, the research studies social processes in its context and seeks to convey the experiences of a case in its complexity. In this research, a qualitative case study is conducted to provide a detailed understanding of community participation in green stormwater infrastructure efforts, an issue that is too complex to solely be measured quantitatively. The qualitative case study approach gives the richness to the story of this case. Stake (2010 p. 15) characterizes qualitative work by:

- interpretation – there may be different views for the same phenomenon;
- experiences – data collection is field oriented and not pre-arranged;
- situation – a detailed description of the context gives a holistic construct; and
- personal – for instance, it seeks individuals view points, and the researcher is the main research instrument.

This work takes on these characteristics, and for these reasons and the aforementioned, a qualitative stance was taken.

Overview of Case Study Methodology

The case study approach is commonly applied in medicine, law, economics, urban planning, and social sciences (Creswell, 2013; Yin, 2009). Case studies can either be entirely qualitative or quantitative, or both - as mixed methods (Yin, 2009). Regardless of where they fall on the spectrum of qualitative and quantitative research, case studies are used to detail descriptive, exploratory and explanatory research questions (Yin, 2009). This research approach enables the researcher to build comprehensive understanding of a system bounded by place and time by using multiple data sources (Creswell, 2013; Yin, 2009). A case study is defined by Yin (2009 p. 18) as follows.

> "A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context. It copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from

the prior development of theoretical propositions to guide data collection and analysis."

Cases can be people, groups, organizations, or processes (Creswell, 2013) and can be studied as single or multiple case studies. Unlike the multiple-case study approach that usually involves case comparisons, single case studies are often, by design, "less constrained" (Miles et al., 2014 p. 39) and require fewer front-end conjectures and preparations before the study is conducted. As insights are uncovered during the study, the approach can therefore be reasonably adapted to suit. Since multiple case studies are used for more comparative analysis to highlight different viewpoints on a central issue (Creswell, 2013), they require more upfront protocol structure to study effectively even though adaptation can take place during the study. Whether the single or multiple case study approach is used, they can be applied to multiple research scenarios that range from evaluating and describing interventions in reality, to explaining occurrences for interventions without focused outcomes (Yin, 2009).

There are several challenges associated with case studies, especially single case studies. One concern is that the single case study cannot be used to make generalizations. However, the purpose of a single case study, as with this work, is to provide "analytical generalization" that develops and generalizes existing theories (Yin, 2009 p. 15) for the issue studied. Another challenge is that this approach can be very resource intensive in terms of time (Yin, 2009) and sometimes money. To address this issue, the bounds of the study can be appropriated to increase efficiency, and the data collection methods can be adjusted to suit the specific case(s).

Data Collection Methods

This case study investigates existing and proposed green stormwater infrastructure projects in the Proctor Creek Watershed. Interviews and relevant documents are used as the main data sources to fulfil the objectives of this research.

Firstly, the search for context and information began broadly. Gathering information about the case began with internet searches for documents pertaining to Proctor Creek, and speaking with individuals familiar with and involved in Proctor Creek situations and projects. The researcher contacted four individuals involved with Proctor Creek affairs in different capacities. One of the first individuals was found through a networking opportunity and the other individuals were found by the snowballing effect, which involves asking participants if they would recommend other potential participants.

The objective of these initial conversations was to continue assessing the suitability of the case and to gather information about the context of the case. Also, the researcher attended two Urban Waters Federal Partnership meetings where there were representatives from federal and state agencies including the U.S. Environmental Protection Agency, the Federal Highway Administration, the U.S. Army Corps of Engineers, Federal Emergency Management Authority, U.S. Forest Service, and the Georgia Environmental Protection Division. Access to these meetings was granted by an U.S. Environmental Protection Agency employee. Notes were taken at these two initial meetings and reviewed to assess the suitability of the case study.

Once the context was established, the researcher continued to collect field notes, conducted interviews, and reviewed documents to collect case study data.

Field notes: The researcher attended seven Proctor Creek Stewardship Council meetings between July 2015 and March 2016 to continue understanding the context of community and engagement for the case, to identify research participants, and to take field notes. The meetings took place on the first Friday of every month. Also, the researcher attended various community events and meetings that were open to the public, all relevant to Proctor Creek projects between. In addition, the researcher attended the three green infrastructure community forums that were held in March 2015, November 2015, and April 2016. The researcher took field notes as a participant observer at events and meetings. These field notes were used to enhance case study descriptions. Also, they were used to corroborate interview findings.

Semi-structured Interviews were conducted with participants from different groups of stakeholders on Proctor Creek projects. These participants included persons from the city, federal government agencies, community residents, and community non-governmental organizations. There were 14 interview participants. Potential participants were first identified from names in documents as those who were heavily involved with Proctor Creek clean up and development efforts. Table 3.1 shows the range of stakeholders who were interviewed.

Table 3.1: Interviewees represent a range of stakeholders

Role	Number of Participants
Community resident and leader	3
Community coordinator	1
Employees of national and community non-profit organizations	4
Students from area universities	2
City of Atlanta, Department of Watershed Management employee	1
EPA employee	3

The researcher informally spoke with potential participants at various times during events and meetings. These conversations allowed the researcher to understand the suitability of participants to be interviewed and to establish rapport with potential interviewees before asking them to be participants. These interviews sought factual information, perspectives and opinions (Saldana, 2011; Stake, 2010) from interviewees about the context and community participation processes in moving forward with green stormwater infrastructure implementation in the Proctor Creek watershed neighborhoods.

The interviews followed the focused structure (Yin, 2009) with an average time frame of thirty five minutes. The average interview time was forty minutes. Semi-structured interviews were preferred over structured interviews due to the variety of the informants' backgrounds. Their range of experiences influenced additional questions for insight. This approach was preferred over the unstructured interviews because there was a specific objective to meet. New knowledge was gained through the perspectives of the participants in the study. Follow-up information was requested where necessary during the interview to ensure that the descriptive story is accurately developed. The interviews

took place at locations convenient to the interviewees, and over the phone. There were seven phone interviews and seven site interviews. These sites included interviewees' offices and community event locations. Each interview was audio-recorded with the participants' permission.

Before each interview began, the researcher shared the purpose of the research, and gave a brief overview of how the interview would proceed. Each participant was given information about being in the study by describing the risks and discomforts, the possible benefits, and their protection of privacy and confidentiality. Participants were given the option of keeping their identities confidential or disclosing their identities for research reports and writings subject to publication. For phone interviews, the researcher emailed the participants the consent forms before the interview or read it aloud if email was not accessible. They were asked for verbal consent, or if they were able to scan and re-send their written consent, they did so. Participants were asked if they had any questions before the interview started and were informed that they were free to ask any questions for clarification. During the interviews, the researcher took handwritten notes to note key points from responses and ask follow up questions for clarification. Participants were asked open ended questions and were asked to elaborate and clarify responses where the researcher thought appropriate.

The first set of interview questions asked for the interviewees' background in relation to their connection with Proctor Creek projects and the work that they do, to give context to each interview. The following set of questions asked for their perspectives and experiences in line with attributes that were studied. As the conceptual framework

continued to be revised, interview questions were adapted accordingly. The protocol served as a guide, and so all questions listed on the protocol were not asked to every participant. Additional questions were asked based on the interviewee's background and the flow of conversation. See Appendix B for the interview protocol. The researcher transcribed the first ten interviews. A professional transcriptionist transcribed the subsequent interviews, in addition to one interview already transcribed by the researcher.

Document Review bolstered findings from interviews with data for each of the variables being studied. Documents provided rich data especially for context and process. Additionally, they contributed to the output theme of the conceptual framework because they hold record of decisions and plans for stormwater infrastructure. For example, one key document coded and analyzed for this case study is the *"Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision"* produced by Park Pride, described further in Chapter 4. The document gives the technical information about the study area and shows the process of community input in conceptual planning and design for potential green stormwater infrastructure sites. Another such report is the *"Boone Boulevard Green Infrastructure Conceptual Design"* which itself is an output of collaborative decisions from stakeholders on the project. The City of Atlanta's "*Green stormwater infrastructure Strategic Action Plan"* and "*Upper Proctor Creek Watershed Action Plan: A Waterway on the Rebound"* were reviewed as well. A list of documents reviewed is provided in Appendix C.

Data Analysis and Synthesis

Interview transcripts, documents and some field notes were analyzed by coding, one way to analyze qualitative data (Saldana, 2009) to interpret and explain its meanings (Miles et al., 2014; Stake, 2010). First cycle coding was done by provisional coding, a method that uses "a predetermined start list set of codes" (Saldana, 2009 p. 144), and descriptive coding. Provisional codes were informed by the attributes outlined in the conceptual framework. The theoretical constructs defined in the conceptual framework provided the themes for this work. A codebook was developed that defined each code and highlighted when to use the code (See Appendix D). This codebook was revised during data collection, conceptual framework development, and the descriptive coding cycle. Content analysis of the data was further done by descriptive coding, which lead to a summary of the data content (Saldana, 2009). Not every section of the data sources was coded, but only the sections relevant to the research questions (Miles et al., 2014). Further analysis of these provisional and descriptive codes was done by thematic analysis, which provided extended phrases to summarize the data. Additionally, second cycle elaborative coding (Saldana, 2009) sought the links and interrelationships across themes in the data that supported or refuted previous theories from previous studies.

The NVivo program, a computer assisted qualitative data analysis software, was used to code and categorize text from interview transcripts, documents and field notes to quicken the research process and provide more time for analysis (Yin, 2009).

Validity and Reliability

This section gives insight to the researcher's actions to preserve authenticity and accuracy for the process of describing and analyzing the case situation in the study (Bloomberg & Volpe, 2008). Reliability and validity checks are throughout all stages of the research process, and are highlighted in the data collection and analysis stages. For this research, the researcher is the main research instrument, which may subject the research to human errors and issues in interpretation (Stake, 2010). Thus, several checks were established to help ensure the unbiased quality of this interpretive research.

A strong case study can be conducted without being in the field, simply through phone interviews and document review (Yin, 2009). However, the researcher attended and participated in several events for Proctor Creek watershed, even those unrelated to stormwater infrastructure. This allowed the researcher to understand the case context much more fully through experience and interaction with the place and the persons involved. Also, this helped to dispel initial researcher biases.

Multiple sources of data were used in this study to substantiate findings where possible. For instance, for green infrastructure community forums, the researcher took notes at the event, reviewed online published articles about the forum, and gained additional insight from interviews. Another example is the following. One document – *The Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision (PNA Study)* was used to understand participation processes that occurred a few years ago. Interviews corroborated findings from the document. Additionally, reviewing available documents allowed the researcher to streamline questions to each interviewee.

Several validity and reliability checks were done in the interviewing, transcribing and analysis phases. During the interviews, there were "member checks" (Saldana, 2009) to ensure that the researcher understood what the participant said correctly. For example, after some responses during the interview, the researcher summarized what the interviewee said, then asked if what was said is correct. During the analysis stage, the logic of interpretations were evaluated and continually checked against the themes found in the literature. For transcription reliability, both the researcher and a professional transcriber transcribed one interview to compare transcriptions and ensure transcription accuracy. In addition, coder reliability was checked by the level of agreement between the researcher and a peer for statement excerpts from two interview transcripts.

Limitations of Research

The primary limitation of this research comes from it being a single case study. As such, the results are not generalizable to green stormwater infrastructure planning and implementation in all urban areas. A meta-analysis of similar case studies would need to be done in order to generalize findings on this topic. The scope of this research did not accommodate such an approach. Though the research is not generalizable, the insights are transferrable, and it does "expand and generalize" (Yin, 2009, p. 15) the theories used in this study.

Most events that the researcher attended were not solely on the topics of stormwater management and green stormwater infrastructure. It was expected that there

would be more ongoing participation mechanisms focused on facilitating community participation for green stormwater infrastructure design decisions. However, the researcher used this as a tool to understand the context and to ask more focused questions about participation for green stormwater infrastructure during interviews.

Another limitation was the restricted sample size of interview participants due to availability and willingness of potential participants. Interviewee insights and experiences do not represent the views of all those involved in community participation processes. More participants would increase the credibility of the study. To address this limitation, findings from documents and field notes helped to support some interview content. Future work can include more participants, especially more interviewees who are community residents.

As interviewing progressed, when participants were asked if there was anyone else they would recommend for an interview, they gave the names of people already interviewed, or planned to be interviewed. This represented saturation. However it must be noted that interviewees included only those who are actively involved in Proctor Creek community affairs. Those who are not involved were not included in the interview sample. Hence, content of these interviews are not representative of the entire study area community.

Though interviewees' perspectives give the advantage of lived experience, their responses are based on memory at the point in time of the interview. To address this

limitation, at the end of each interview, participants were asked if there was anything else they would like to add to their responses.

Chapter Summary

In this chapter, I described the case study methodology, and the overall research approach for this study. I detailed how the case study method was used, in data collection and in data analysis. I presented and addressed issues of trustworthiness for this of conducting a qualitative case study, and particularly for this research. To conclude this chapter, I included the methodological limitations of this research.

CHAPTER FOUR

CONTEXT FINDINGS AND DISCUSSION

Introduction

The data presented here describes additional information on the context in terms of the type of issue and civic community conditions. Context factors play a role in designing participation processes to improve the quality of desired outputs, contributes to understanding implementation (Koontz & Newig, 2014; Margerum, 2011; Tang & Brody, 2009). The findings presented in this section shape the understanding of participation processes, outputs and implementation by providing insight for the most salient context factors affecting each theme.

Context Description

One discernable finding in the case context was that civic community characteristics such as social, human and political capital, as well as levels of trust, were bolstered by collaborative partnerships in the community. Community non-profit organizations were instrumental in leveraging resources for community development towards stormwater and other watershed issues. One interviewee from a community non-profit organization explained,

> "So one action of the participatory action that's occurring is a partnership or a layer of engagement is of the NGOs, the non-profit organizations that are in the watershed. So people like WAWA [West Atlanta Watershed Alliance] and the Chattahoochee River Keeper and the Community Improvement Association and maybe to some extent National Wildlife Federation and Conservation Fund. So

> there's some national and there's some local NGO's. We are all attempting to partner and collaborate and even work to facilitate the pass through of funds and even resources, so that we support the residents."

One organization that operated through the collaboration of multiple community non-profit organizations and residents is the Proctor Creek Stewardship Council. The group's characteristics model those of watershed partnerships found in the literature (Genskow & Born, 2006; Koehler & Koontz, 2007; Leach et al, 2002). For instance, the Proctor Creek Stewardship Council addresses a comprehensive range of watershed issues while educating the community on these. Social capital in the community is building through their work and the work of other groups. The group focuses on collaborative efforts among the community, various agencies and community non-profit organizations. Genskow & Born (2006 p. 62) state that "partnerships that form around watersheds are fluid and often ephemeral, which has implications for how agencies, funding organizations, and local partners engage, evaluate, and provide resources for the efforts." This organization, in collaboration with others, provides a medium and a filter especially for local and federal government agencies to work through and communicate with the community. In addition, these groups address other context features such as socio-economic conditions and ecological conditions through their work by including residents in citizen scientist activities and participatory research.

Type of Issue

The question "Can you describe stormwater issues in the watershed's neighborhoods?" elicited responses from interviewees. Though there are many other issues in the watershed, the focus here is the flooding occurrences. Content analysis of documents also provided added descriptive data for the type of issue.

At several meetings, residents voiced their frustrations with flooding in their homes and the subsequent effects on their lives. At a meeting during a week of heavy rainfall, one resident voiced his concern, "Every time it rains, it gets real scary because you don't know how high the water will rise." When asked to describe the adverse effects of heavy rainfall events in the area, a young community resident described the following:

> "Well I've seen houses along that Creek have high percentage of mold in it, mildew, and asbestos. And it's an environmental impact as well, because a lot of people who live in those homes are sick. They're usually coughing when they're talking. And not only that, sometimes when we have heavy storms, the water rises so high that I've seen it wash away a retaining wall before.
>
> I've seen water when it does not have anywhere to drain to it just builds up in neighbors' yards. So it's actually quite dangerous in my community due to stormwater and because of where my neighborhood is located, we're actually at the bottom of the slope right before you get to the creek, so all the water that's travelling towards the creek doesn't actually go toward the creek. Sometimes the water just stops somewhere and it just sits and that creates an environmental issue."

The problems for Proctor creek begin in downtown Atlanta–the location of the headwaters. One interview participant from a national non-profit organization described that "it's about 265 acres of impervious concrete sits on top of the headwaters for this creek." The growing population and the continuous development in the central business district, downtown Atlanta, contribute to even more impervious surface and thus more

runoff. Stakeholders and authorities recognize that stormwater management challenges must be resolved in the headwaters to mitigate flooding effects in Proctor Creek watershed neighborhoods. One lifelong community resident described his experiences with flooding:

> "Well, we noticed that our mobility is limited after a hard rain, and that you'll have a few flooded places. We never related that to other developments adding more water to our stream, you might say. We just knew that after a rain we'd have to wait a little longer before streets would dry out, or dry up.
>
> We know now it was because of development of downtown Atlanta. We just didn't relate it to that. We just know there were certain places that, if you were driving, you suddenly could flood out. The water would splash up on your tires. Then there were places where the water would come all the way up to your engine and drown you out."

A member of a community non-profit organization similarly explained:

> "And so Proctor Creek is receiving a lot of the downtown, central business district stormwater. It is also one of the corridors that has become the most industrialized, and it's also one of the corridors that just so happens to have a lot of the urban renewal redlining effects. So the property values drops, disinvestments happened. Proctor Creek just so happened, like in many cities, became the poster child for urban blight. You know in some places in a city, it's just a perfect storm for urbanization to have created perhaps unintended consequences of urban blight."

Civic Community Conditions

Social capital is bolstered by surrounding universities

Many ongoing collaborations draw on the intellectual and resource capitals of the area's universities and feed into the social capital of the community. The Atlanta University Center (AUC), situated in the upper part of the watershed, houses four universities, includes Spelman College, Morehouse College, Morehouse School of Medicine and Clark Atlanta University. Georgia Institute of Technology sits on the border of the watershed boundaries and close to the English Avenue community. Additionally, Georgia State University and Emory University are close to the watershed boundaries. Each of these universities has or has had ongoing collaborations with the community for necessary progress.

For example, a graduate student from Georgia State University led a project that involved participatory research. Residents were involved with data collection and learned skills as citizen researchers. The group created an interactive application that allowed users to map the site of problems in the area. An interview participant who worked on the project-also a Georgia State graduate student at the time of interview, explained that:

> "…when you're out in the community, you would be able to plot if you saw a stormwater drain that was collapsed or tires, things like that. You can pull out your Android phone or your Apple phone…and you can mark-up that point where that location is."

The participant also added the community benefits as participants.

> "The whole point of that was to provide a tool that the community can be able to be champions for their own space."

Another example is the relationship between the Atlanta University Center and the community for the Green stormwater infrastructure Initiatives described in detail further in this chapter. The initiative aimed to foster collaborations among community residents and the faculty and staff to promote the implementation of green stormwater infrastructure on the institutions' properties.

In the community-university partnerships, the university members leveraged the residents' local knowledge and lived experiences to inform the respective works.

Human capital needs to be increased

Despite the intellectual and resource capitals closely available, disconnects still exist in the community's skills and capacity needed for problem solving. Though some the residents who actively participate in meetings and participation events are college educated, many of the residents lack the skills and education needed to directly be a part of fixing the problems in the area especially those that contribute to green stormwater infrastructure development. There is the need for capacity building and education among residents since the residents are the ones most invested by matter of daily life experiences and well-being. One participant, a community resident remarked:

> "We're often told that there's a mismatch between the jobs that are available in the community and the people that are available in the community. Some lack skill, some lack will."

Levels of trust within the community and towards external groups affect working partnerships

Numerous organizations work within Proctor Creek. The success of the work is largely based on levels of trust from the community towards these organizations and levels of trust among these organizations. Leach & Sabatier (2005) identify trust among various groups and stakeholders as an important indicator of collaborative success. One question, "Have you seen the community and all these different stakeholders working together to address the problems and challenges with stormwater?" elicited the response from a community resident:

> "Yes. I see them working together. That needs to be communicated that they're working on their common goals together. There are those who don't know why and how others have taken interest in the location if they're not from there, but that case can very well be presented that the water is your neighborhood before it's in ours."

The community has close knit social groups but is cautious of outsiders who come in to "help" the community; however, once a common goal is expressed caution is dispelled.

> "Yeah, there has been some concern, but there are organizations that formerly were not related or connected, being shown that there is a relationship between the neighborhoods that's right before, along the Proctor Creek line, and right after us, along the Proctor Creek line, so we have a common objective as to being able to manage water that comes through our neighborhoods, where possible."

While groups are working together, another interviewee, a community coordinator, thought it was important to consider how conflict occurs.

> "[There are] definitely sources of conflict. There's a lot of suspicion in the north side of Atlanta. There's a whole background history that has led up to that and caused that. I think communication is really hard. While there might be two organizations working in the same space that have similar goals, if they're not

> communicating clearly in a way that each understands, then I think there can be misunderstandings, grudges can build up and what have you. I think that's really common, even within a single organization. There are so many filters within the course of our communication where I say something to you with a certain thing in my mind of what it means, then you hear it and you're filtering it through based on your interpretation of that. There are a lot of subtleties that get lost, even in just face-to-face communication."

Over the years, many organizations worked within Proctor Creek to help the community. Over-planning and lack of visible progress is causing lack of trust towards organizations and government institutions. The community coordinator continued:

> "If you were to talk about the English Avenue and Vine City neighborhood, Washington Park, a lot of folks have expressed feeling like they've been planned to death. Some organization will see this neighborhood in West Atlanta and suddenly have this come-to-Jesus moment of, "Oh my gosh, they need our help. We're going to come in, help organize the community, figure out what their priorities are, help them come up with their plan." …It comes to the end of the planning process, they put together some kind of report, which is invariably way too many pages for most people to care to read, and then leave."

Concerning trust towards government institutions, there are mixed feeling towards them. A community resident mentioned:

> "…there are those who look to the government, and this is our salvation, the government. Then others, they look at the governments, whoa! The government, that's the one that's allowed it to get to this point."

On the other hand, an EPA employee described the community's trust towards the EPA as the community reached out to them:

> "We (EPA) were consulted by the community because the City wouldn't listen. So many people said that. I can't discount it. And that's what happens in these environmental issues all around the country. Things kind of boil and bubble for 25 years. And then there's some sort of event, some crisis, then the federal government comes in."

Another salient finding was the apparent lack of trust and negative perceptions towards the City of Atlanta Department of Watershed Management. The department appears to be aware of this distrust. This is evident through one example; Trust for Public Land, a non-profit organization, will facilitate community participation for a stormwater project in the upcoming months. This can make a difference with how the project is received by the community and the type of input they give.

Proctor Creek watershed group gives residents political leverage

The Proctor Creek Stewardship Council is a community-led organization where stakeholders participate in learning and efforts towards Proctor Creek's restoration. It was created to support and sustain resident's engagement efforts through a collaboration of several organizations and community members who worked within the area and surroundings for several years. One of the stated goals of the Council is to "advocate for the fair treatment and inclusion of the underserved Proctor Creek communities in the planning and implementation of projects." According to an interviewee from a non-profit organization who helped to form the Council, it serves as "the voice of the people towards any development or any planning pertaining to what to do with Proctor Creek." For instance, a new stadium is being built at the headwaters of the watershed and project managers came to the community through the Proctor Creek Stewardship Council. The community had input on the stormwater infrastructure designers planned to implement. The interviewee mentioned:

> "...the council is space where people at all levels in the state recognize this is where you can start the conversation about any issue with Proctor Creek. So when the stadium was being built, they know there was a council so they said 'can we present to you what we want to do?' And the council told them, yes it's okay."

As mentioned previously, the U.S. Army Corps of Engineers came and presented their plan for a feasibility study and requested community input. Councilmen and women come to the council to present the resolutions they are working on that pertains to the community. While other stakeholders do have input, the concern is what the residents and stewards have to say. As they gather in a single voice, they consolidate ideas and action plans to put pressure on those in office to serve them.

Chapter Summary

This section functions as exposé, a topical examination especially of the civic community conditions. The most conspicuous and also most salient finding was that the civic community condition attributes were supported by community partnerships. The next chapter describes participation processes for visioning, education, and planning and designing green stormwater infrastructure strategies along with the processes' output.

CHAPTER FIVE

PROCESS, OUTPUT, AND IMPLEMENTATION FINDINGS AND DISCUSSION

Introduction

The conceptual framework from Chapter 2 continues to provide the structure for this chapter's organization. This chapter describes the case study of green stormwater infrastructure development in Proctor Creek through additional context findings, followed by process, outputs, and implementation themes. Attributes are linked across the different themes according to the data, and including linkages from the context theme from Chapter 4. Each section in this chapter answers the following research questions:

1. How do community participation mechanisms facilitate decisions for green stormwater infrastructure?

2. How do context features and community participation processes influence implementation of green stormwater infrastructure solutions?

The case study intends to show how context and community participation process elements interact to influence decisions for green stormwater infrastructure development and implementation. The literature addresses both community participation and green stormwater infrastructure; however, no study details the interaction of the two fields in depth. The results in this section address the gap in the existing literature by providing an in-depth, representative case study. Each section continues to share excerpts and quotes

from documents and interview transcripts to provide evidence that "supports the findings of the study" (Merriam, 2009 p. 16).

Process Description

In this section I describe visioning, education and capacity building, and planning and designing processes for green stormwater infrastructure in Proctor Creek watershed. The findings in this section answer the second research question:

> How do community participation mechanisms facilitate decisions for green stormwater infrastructure?

To answer this question, I focus on discrete participation processes and their characteristics in terms of type of mechanism, level of participation, description of participants, and goal(s) of process. Table 5.1 summarizes the community participation events directly related to green stormwater infrastructure. I describe these in detail later in the chapter.

Table 5.1: Discrete community participation processes for green stormwater infrastructure development

Process Stage	Mechanism	Level of Participation				
		Inform	**Involve**	**Consult**	**Collaborate**	**Empower**
Visioning	Design workshop		x	x	x	x
	Visioning dinner	x	x	x		
	Preliminary design reviews	x	x			
	Draft report review	x	x	x		
Education and Capacity Building	Community forums	x	x	x		
	Roundtable discussions		x	x	x	
	Tour of GI demonstration site	x	x			
Planning and Designing	Workshops		x	x	x	x
	Meetings	x	x	x	x	x

Figure 5.1 on the following page shows the timeline of events described in this section. Events were not sequential, but overlapped. Education on green stormwater infrastructure occurred during sessions of the visioning process to ensure participants understood the topic and were able to participate effectively. Training for capacity building was done during the planning for one demonstration project, fully described later in this section. Finally, three community forums for green stormwater infrastructure were held between 2015 and 2016. These are not exhaustive participation events, but they represent the ones commonly highlighted in the community.

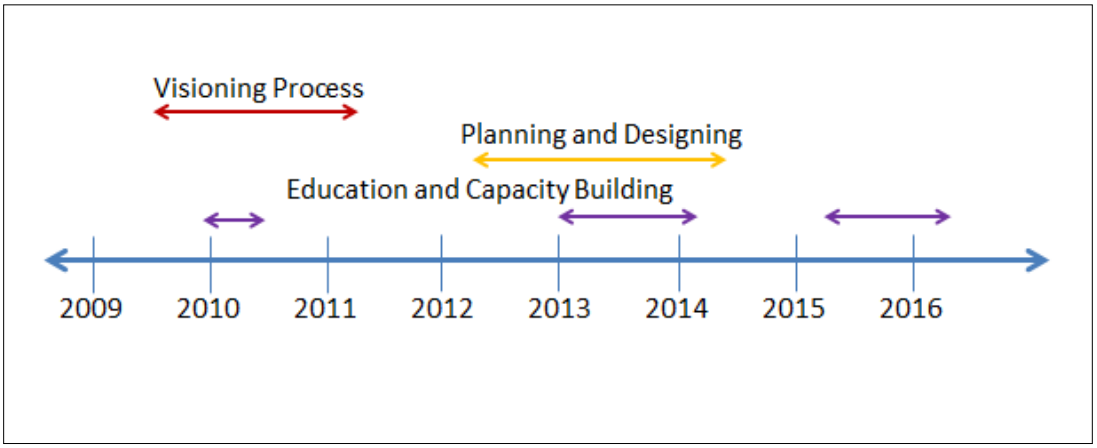

Figure 5.1: Timeline of participation process events described in this study

The participative processes in this study align with collaborative participation (Innes & Booher, 2004) rather than traditional participation. There were more collaborative dialogues than one way information flows of pre-planned projects thus far. Stakeholders are cognizant of the social and political context, or become aware of it once involved. Thus, context recognition created more dynamic processes. Luyet et al. (2012 p.217) asserts that specific social, political and legal contexts give a project its constraints and explain process choices. In this case, the most prevalent context factors influencing the push for increasing levels of community participation include socioeconomic conditions and civic community conditions.

Social stability largely influenced the type of input the community gave during participation processes. Interviewees mentioned that the community repeatedly prioritized prevailing social conditions, such as lack of jobs and abandoned properties during visioning and planning processes. Some external groups working with the community learned to keep this socioeconomic context in mind. For example, one group - the Conservation Fund that worked with the community to implement a park featuring green stormwater infrastructure, was continually reminded of the need for jobs in the beginning stages of their community participation processes. An interviewee from that group said:

> "As I mentioned, the loudest message we got was we need jobs…..We went out of our way to provide not one, but 2 different opportunities for job training for community members. We really tried to incorporate their needs as much as possible and to make sure that we thought of this as a community-driven project."

While this brought the opportunity to align community priorities and stormwater management priorities, this sometimes stunted achieving higher levels of participation and prolonged the participation process.

Another main process finding was the perspective and priority for educating the community on green infrastructure for stormwater management. Interviewees, especially those who were not community members, spoke of the need for education and outreach on the topic due to its technical nature. A study on the perspectives of the participation process for watershed management planning by Webler & Tuler (2001 p. 35) found that "a good process emphasizes constructive dialogue and education" and that "outreach is of primary importance." Participant education on the issue is critical for meaningful

participation (Montalto et al., 2012; Ryan & Brown, 2001). Specific green stormwater infrastructure forums−described in detail later in this chapter−facilitated the growth of community knowledge on the subject, while using local knowledge to identify implementation challenges and to formulate steps to move forward with green stormwater infrastructure (GI) implementation. Other meetings began by educating the participants on the subject. This facilitates improvement on the quality of input from participants. These instances describe that process facilitators went beyond simply informing about the issues and the proposed project, but engaged participants through education.

One observation at the green stormwater infrastructure forums was that non-community residents out-numbered community residents. Stakeholders who were non-community residents present at these meetings included EPA employees, employees of non-governmental and non-profit organizations, students and faculty from area universities. While Webler & Tuler (2001 p. 35) found the perspective that "the goal of the outreach is to involve people who really can participate meaningfully and constructively not to merely create large turnouts," there should be more outreach to community resident participants since they directly feel the impact of the problems.

This case illustrates that education circumvents the public perception challenge facing the implementation of green infrastructure for stormwater management. Keeley et al., (2013 p. 1099) found that there were challenges "making the connection between unmanaged stormwater and environmental degradation" and "addressing green stormwater infrastructure in the community." Interviewees mentioned that the community

wants green stormwater infrastructure in their neighborhoods to address stormwater issues. Their perceptions were that green stormwater infrastructure could have multifaceted benefits and so community residents and other stakeholders advocated for it.

The following descriptions of processes substantiate these findings further.

1. **Visioning Process**

Goal of process

The overall goal of this process was to develop with community input, a conceptual vision for green space that manages stormwater and acts as a community amenity. The study proposed parks and green space that included green stormwater infrastructure strategies on each site.

Type of mechanisms and levels of participation

The visioning process was an 18-month process that began with Steering Committee meetings involving community leaders. There were twelve recorded Steering Committee meetings over a nine month period. In addition, there were six public meetings which began several months into the process. The visioning process hosted by Park Pride, a nonprofit organization that works with communities in Atlanta to improve parks, used a more extended and intense visioning process than usual. The *Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision (PNA Study)* p. 33 reports:

> "In addition to coordinating a series of PNA Steering Committee Meetings, the Design Team has spoken with the English Avenue Neighborhood Association twice and hosted a dinner for community input with that organization. Park Pride hosted several weekend public meetings held at the Neighborhood Union Health Center. Residents and Park Pride staff went door-to door distributing fliers highlighting the Visioning process, the public process, and advertising the various ways available for people to get involved. Park Pride hosted a booth at the Festival of Lights, where the preliminary plans were shared with residents, and collected contact information from interested persons."

The Steering Committee provided information on threats to the success of the proposed projects. Thus, the level of participation is considered to be consultation in this case. The public meetings—open to the wider community—commenced by educating the participants about green stormwater infrastructure, which continued into design workshops, preliminary design review, and plan reviews. The community was informed with information to help accommodate their decision making roles in the subsequent meetings.

There was a crucial education component to these meetings especially since most participants did not know what green stormwater infrastructure was, and thus couldn't make decisions towards green infrastructure technologies for stormwater management. The education component is represented in Figure 5.1 directly under the timespan of the visioning process. One informant mentioned that even though people evaluated plans, they harped on core values such as the need for jobs, respecting the historical and cultural ties in the area while finding a way to reduce flooding. Decisions involving the more technical aspects were not apparent. However, the community's preferences were included. The levels of participation are considered to be informing, involving and consulting. The document also stated that the community participants agreed that their views were represented. When a community leader was asked, "what was your perception of how much the community was able to actually make input into the decisions that you see coming out?" He replied:

> "I think it was kind of hard at first. The first two to three months they didn't grasp it grasp it. They had challenges. Because the only thing they were thinking about

> was ‘my house is going to be torn down, we don’t have anywhere to stay,’ and we were like ‘no’. We’re going to build, we going to do some home improvement. We don’t want to tear it down.”

As to whether he thought they felt engaged in the process, he responded:

> “Oh yeah, as a matter of fact those are the ones still there. They’re trying to further the design plan that we still have in other municipalities and counties and whatever. Because they’re saying if we can do it in our communities, then we could do it in our community across the different jurisdictions. The other ones who left said well look, we’ll take what we know, we’ll add on to it and we’ll build our own organization. So now we have about 2-3 other organizations that have been formed since we did this PNA Study.”

Description of participants

The participants included community leaders and residents. The Steering Committee meetings mostly included community leaders and leaders of non-profits that worked in the area. The steering committee included approximately 11 persons, and at the majority of meetings there were more than 5 participants. The public meetings consisted of residents and leaders, and members of non-profit community groups. Throughout the visioning process there were approximately 20-30 residents who participated. Some of these participants were consistent throughout visioning some were not. With regard to who participated, one interviewee, a community leader said:

> “Well we tried to add more people, switch them up because you had different mindsets coming to the table. Some remained, some didn’t. Some would like to be part of the planning; some would be a part of the implementation.”

There were intensive outreach attempts to encourage participation. The *PNA Study* (p. 33) reported that:

> "Park Pride reached out to the three communities via e-mails, their neighborhood leaders, the 30+ churches in the PNA, and various local non-profits and special interest groups."

Type of output

The Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision (PNA Study) is the final document from the Visioning process that contains details of conceptual plans for green stormwater infrastructure sites to promote stormwater management for combined sewer capacity relief, green space as community amenities, and greenways for connectivity in the watershed. The document is thought to generally represent the community's ideas and input as mentioned by several interviewees and the document itself. The community vision and goals are incorporated into this document.

2. Education and Capacity Building

Interviewees, documents and informants strongly suggested the need for capacity building and education to advance green stormwater infrastructure implementation. While educating and capacity building are considered to be at the informing level of participation, it is utilized to increase levels of participation. The processes for education and capacity building aim to empower residents to increase their decision making capacity towards the issue.

Many efforts were indirectly related to green stormwater infrastructure while some were more direct. In this section two direct efforts are described in detail. They include processes for education and capacity building for implementation of a

demonstration site. One interviewee, who considered the process from visioning to implementing on a green stormwater infrastructure project remarked,

> "This community probably knows more about green stormwater infrastructure than any community in America….We've been trying to make sure the community residents understand that much of the environmental health hazards that they have, the mold issues, the pollution issues, the litter issues, are directly related to the need for green stormwater infrastructure in their community."

Green infrastructure community forums and conference

Table 5.2 presents summarized details of the forums and conference. Originally, there were three forums planned but only two took place before the conference. These forums were organized by ECO-Action (Environmental Community Action), a non-profit organization in collaboration with other partners. The U.S. EPA funded the Green stormwater infrastructure Initiative through the Urban Waters Small Grants program. An online article published by ECO-Action, *Green stormwater infrastructure at the Atlanta University Center* explains that the initiative facilitated teamwork among residents and the AUC faculty and students to understand the impacts of the AUC's runoff and generate solutions. The initiative targeted this area because there is the potential to capture up to 22.4 gallons of stormwater on these campuses before running off to the lower elevation neighborhoods plagued by flooding.

Table 5.2: Green infrastructure community forums and conference details.

Event	Date	Goals	Site
Green Infrastructure Community Forum I	March 17, 2015	• Provide information from community members, non-profits and governmental organizations outside of the AUC • Identify next steps for continuing initiatives in green infrastructure efforts. (Source: *ECO-Action Hosts First Green Infrastructure Community Forum at Spelman*, online article by ECO-Action)	Spelman College, Atlanta GA
Green Infrastructure Community Forum II	November 14, 2015	• Share information on green infrastructure to increase community awareness. • Update the community of green infrastructure activities going on in the Proctor Creek North Avenue and Vine City area and also the Atlanta University Center (AUC). • Create a structure, a process and a support system to advance green infrastructure in the conceptual plan. (Source: Interview transcripts and researcher field notes)	Lindsey Street Baptist Church, Atlanta GA
Green Infrastructure Conference	April 21, 2016	• Increase public awareness of green infrastructure • Present student-developed conceptual plans to capture stormwater at the AUC center • Encourage community and AUC leaders to leverage their resources to transform these stormwater conceptual plans into "shovel ready designs." (Source: ECO-Action webpage and researcher field notes)	Clark Atlanta University, Atlanta GA

Goals of Process

The goals of these forums and the conference are summarized in Table 5.2. An interviewee mentioned that these forums provided a way to engage the community and keep the passion going to move forward with green stormwater infrastructure. The same interviewee, referring to the second forum, said that he saw all the goals for that session being fulfilled the day of the forum. However, the follow through on one of the goals beyond the forum was not apparent. An example of one instance is the follow through for the goal "create a structure, a process and a support system to advance green stormwater infrastructure in the conceptual plan." Even though a plan for next steps was written, follow up planning meetings did not occur for the group that was tasked with creating action steps for "advancing conceptual planning for green stormwater infrastructure through joint student/community efforts."

Type of Mechanism and Levels of Participation

Type of mechanism was primarily a forum, a meeting where information and ideas were exchanged. The conference was a similar style to the forums, the difference being the scale and the content matter. The conference gave information on the culmination of efforts since the beginning of the initiative and information on the progress of the PNA Vision, described in the previous section. At the forums and conference there were presentations and working groups. The presentations gave information to and from the community while the working groups facilitated discussions for "next step action plans" that were feasible for pushing forward green stormwater

infrastructure implementation. Levels of participation associated with these activities are informing and involving.

In addition, AUC students had the option of taking an elective course that focused on developing conceptual designs for green stormwater infrastructure. In the process of the class they were required to consult with community residents about the impacts of the runoff in their neighborhoods. Thus, the consultation level of participation was achieved in this process.

Description of Participants

At all three green infrastructure community events, most of the same stakeholder groups were represented, and many of the same participants attended. Participants included community groups, residents and leaders, some who identified as faith-based leaders from community churches. From the academic community, Atlanta University Center students and faculty, and Georgia State University students had a strong presence as they presented projects and speeches related to the forum topic. Representatives from nonprofit organizations and nongovernmental organizations who have consistent presence in Proctor Creek projects attended. These included Park Pride, West Atlanta Watershed Alliance, Metro Atlanta Urban Watershed Alliance, the Conservation Fund, Community Improvement Association representatives, and ECO-Action, who led the forums' organization. Government agencies including the U.S. EPA Region IV Atlanta

office, and representatives from the City of Atlanta, Department of Watershed Management and the Office of Sustainability were present.

Type of output

These forums and the conference allowed time for working groups. Information was not just given to participants, but roundtable discussions gave opportunities to give suggestions to improve and advance green stormwater infrastructure efforts. At the first conference groups discussed and wrote notes on the current status, barriers, opportunities and realistic next steps. At the second conference discussion groups created written action plans on four areas including:

1. Developing a Proctor Creek learning exchange
2. Advancing workforce development for green infrastructure
3. Creating a smart relocation resource center
4. Advancing green infrastructure conceptual plans through joint student/community efforts

(Source: ECO-Action's online article *AUC and Community Together Promote Green infrastructure at Community Forum 2* and researcher field notes)

The culminating conference enabled students to share their work on conceptual plans to capture 22 million gallons of stormwater on the AUC campuses. Students gave suggestions of green stormwater infrastructure strategies suitable for their campuses and the placement of these technologies on campus. Primary examples included rain gardens and cisterns.

Skills training for participation in construction of green stormwater infrastructure demonstration site

Type of Mechanism and Levels of Participation

The project management group for one demonstration project, the Conservation Fund, worked with two workforce training programs to respond to the community's request. Young men received paid training in a range of skill building activities including masonry, concrete, demolition and deconstruction, asbestos abatement, and other activities that responded to community needs.

The level of participation for participants was at the information level. An interviewee, who was a participant in the workforce training program, mentioned that there was no decision making on their part towards green stormwater infrastructure decisions.

Description of Participants

Participants in this training included four 18 – 24 year old males from the community.

Type of output

One of the interviewees from a national non-profit organization mentioned that some of these young men received preference for hiring at the National Park Service, US Forest Service, and Fish and Wildlife Service due to the number of hours of training they received and their acquired skillsets. Also, their training allowed them to be a part of the

construction of Lindsey Street Park, the green stormwater infrastructure demonstration site. In addition, the participants received additional training from the contractor who managed the construction of the park.

Planning and Design for green stormwater infrastructure projects

There are two completed demonstration projects. The planning for one of those sites – Lindsey Street Park is described in this section, along with an incomplete green stormwater infrastructure capital improvement project – the Boone Boulevard Green Street project. The first project incorporated non-conventional aspects to the process that considered several context features of the community. Both projects stemmed from the PNA Study described earlier.

GI demonstration site Lindsey Street Park

Types of Mechanisms and Level of Participation

The planning for this project incorporated community participation and engagement focused primarily on the space as a park rather than a stormwater control. When asked if the community understood the green stormwater infrastructure component to the park, the interviewee from the Conservation Fund responded that:

> "We've been trying to make sure the community residents understand that much of the environmental health hazards that they have, the mold issues, the pollution issues, the litter issues, are directly related to the need for green stormwater infrastructure in their community. There's massive erosion issues community members are dealing with downstream. I think we've definitely tried to make that a very big part of the conversation."

The planning process for this project incorporated some non-traditional topics that included workshops on “racism, power and privilege” to engage the community. Once again, socioeconomic conditions and the environmental justice context were considered among other factors that led to these workshops. The same interviewee explained:

> “One of the first things we did was we have a group out of our North Carolina office called Resourceful Communities. They normally work rural, low-income communities in rural North Carolina. We asked them to come to Atlanta because we hadn't really done community engagement before. We didn't know what we were doing. We needed help.
>
> They came down. The first thing that we did was we hosted a 2-day work group, a work shop. Initially my office thought we were hosting a work shop related to park planning Lindsey Street. The folks in my Resourceful Community groups quickly told us, "No, you don't start with a planning of the park. You start with the real issues that affect communities.""

While these workshops were facilitated in light of the context, other context factors such as civic community conditions with respect to levels of trust were increased. This works towards further development in the area.

> “They planned a 2-day workshop on racism and power and privilege. Which I must say honestly scared me to death. I thought, "What are we getting ourselves into." It turned out they were so right. It was the best move we ever made. It was very hard. It was emotional. It was raw. It was painful in many ways. The community respected us so much more for starting with those big topics for acknowledging that these issues existed and for acknowledging that we were an outside national non-profit.”
>
> “I think most the time, the national non-profits, or the bigger groups, come in with the notion that they're going to solve your problem instead of the idea that the community has the solutions to their own problems. When we started with those bigger topics and started talking about ways to provide an opportunity to give the community members power and to bring their voice to the table, that really resonated well with the community members. We gained a lot of trust. We kept with that model for this.”

Considering the preliminary workshops followed by facilitating the community's priorities and inputs for the park, the level of participation is considered to include informing to empowering. The interviewee who described this process mentioned that at times they wanted to move ahead with the project, but spent extra time to accommodate the community's decision-making.

Description of Participants: Participants included 20-30 community residents over the span of the planning process.

Goals of process: The goal of the process was to engage the community in planning the greenspace, a park that included green stormwater infrastructure strategies on site.

Type of output: The type of output was the final plans for the green space designed by a landscape architecture company.

Boone Boulevard Green Street project

The conceptual design for this project was done internally by the City of Atlanta Department of Watershed Management. At the time of writing this report, no community participation had yet taken place for this project. However, there are plans for community participation further along in the design process. Considering the technical aspect of the design work, an interviewee from the Department of Watershed Management explained that community participation was not suitable up to that point.

> "Our department is a technical department…they do public involvement on the projects but it may seem to the community like it is not early enough in the process. So with the Boone Boulevard project the department needed to get it to a point to feel like the project is even feasible. There's a lot of modeling and technical calculations and coordinating with other agencies to be done to get it to what we call a 30% design situation.
>
> Now that we have that, we are ready to share it…we're ready to put it out on the street, as far as request for proposals for a design build contractor to put a bid on it to do the design work. It has taken a really long time to get here. I've been telling the community for a really long time that this took 2 years. But to them it seems like we're doing our own thing behind closed doors, like we're doing all this work without their input. But in the department we didn't want to put something out there that was not fully thought through, and get blasted for it. And also, it's the people on top, it's not like we design the whole thing. It took us 2 years just to get to 30%."

The interviewee continued to explain that the community can be involved in decisions for the placements of the green stormwater infrastructure strategies and through being educated about the project.

Motivation for Participation and Issues of Non-Participation

After interacting with interview participants and attending meetings, it was evident that motivation for participation came from having a common goal to resolve to improve current and future residents' quality of life. Field notes and interviewee responses supported this finding. For example, during meetings, older residents often expressed their desire and interest for improvement, especially in the interest of generations ahead of them. Similarly, Samuelson et al.(2005 p. 164) found that citizens partake in collaborative partnerships because "they believe that the collaborative process

has the potential to enhance the public good by improving the quality of life for all residents in the watershed."

At Proctor Creek Stewardship Council meetings residents expressed frustrations with the lack of progress. This frustration fueled their presence at meetings. Many residents who attended were older residents, and expressed wanting to enjoy the benefits of their participation and giving their local knowledge. Correspondingly, Koehler & Koontz (2007 p. 150) found that citizens actively participate when they feel "comfortable sharing their opinions with others, and bringing to the group substantial knowledge about the watershed." One community resident shared his reason for continual participation for Proctor Creek projects,

> "My motivation is in, since we've said we want to work toward creating an ecological balance in the neighborhood that our children, and grandchildren, and great-grandchildren can live in, we want to makes sure that we create an economic balance that our children and grandchildren."

A student, who worked alongside residents on a collaborative project, had similar comments to the resident's response based on her experience and interaction with residents:

> "Some of these people have families that have been in this community for generations, and that just makes it even more meaningful for them to be there. They want their kids or grandkids to see the community in a different state. And that's why they were so eager to be there. And they were able to help."

Another respondent, who worked with a community nonprofit organization, expressed that residents want to be partners for progress in their own communities.

> "You know, again, by lifting up the fact that the people in the Proctor Creek community want to be stakeholders in their own community, not to just see them as residents, but to see them as partners, with the federal governments, with the local governments, with the state government agencies."

Several different reasons were expressed for issues of non-participation, one being a lack of visible changes despite efforts in previous participation events. For example, one interviewee, a community coordinator gave his thoughts on reasons why there may be a lack of participation.

> "They go through those meetings, sit through those charrettes, at the end of the day, they get this report - or maybe they don't ever even see the report - and they feel like nothing has really changed. Meanwhile, some grad students or consultant has made it a nice project for themselves. Of course that generates certain apathy to participating in any future processes."

The time of events also posed a challenge. At one community meeting, it was recounted that meetings should not be on Wednesday evening since that is a common time for churches in the area to have Bible study. In addition to timing of events, the respondent shared other reasons.

> "Whether it's scheduling and scheduling conflicts when people are available, to a lot of people are just too busy to be able to go to another meeting. There's the sheer volume of numbers of the different meetings that you have to go to...Of course, there's also deliberate exclusion at times, things like that. I would say in terms of the direct resident engagement, you really need to have a very strategically planned process to effectively engage at a community. I don't think that most of the meetings that I have gone to throughout the course of work in Proctor Creek have been that, have been really true community engagement in a lot of ways, or holistic community engagement that has been planned out in a strategic way. A lot of times, that doesn't look like meetings; it just might be a number of different things."

Here we see how the socioeconomic conditions played a role in issues of non-participation. Different interviewees did express that the community voiced their concerns about lack of jobs in the area. Here is how one EPA employee stated the issue.

> "This is a community where it's hard for people to volunteer their time or to participate because when you have no money, and you're worried about keeping your lights on, whether or not somebody's building a park is not the most immediate need. As a matter of fact, we got that as feedback originally. People

said, "We've got massive drug problems in this community. We don't have jobs. We've got all these problems. Why do you all want to waste our time talking about a park?”

Output Description

Many documents and plans exist for Proctor Creek watershed but the ones directly related to green stormwater infrastructure are discussed here. The most pivotal document thus far for spurring green stormwater infrastructure in the watershed is the *Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision* prepared by Park Pride. From that study and vision document, plans and designs for future projects are targeted and being generated. Also, the vision was instrumental in helping to spur collaborations to allow for the realization of the vision recorded in the document.

Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision documents overall planning goals including community goals and stormwater management goals. The document reveals that the community had input in terms of making their priorities known and the design team's stormwater management goals aligned with the community's goals where feasible. The product was generated by educating the community on green stormwater infrastructure, considering and respecting their priorities, and allowing for the inclusion of their decisions. Though there were some differing views, interviewees generally agreed that this document represented community input and there were community decision-making contributions to this document. On the other hand, technical specifications such as stormwater capture and storage targets of the study were developed by the technical professionals without direct community input. However, through the collaborative visioning process, technical specifications of green

stormwater infrastructure technologies in green spaces were designed with the community priorities in mind.

Upper Proctor Creek Watershed Action Plan: A waterway on the rebound, prepared by the City of Atlanta, Department of Watershed Management includes four short project descriptions for parks and green space that will function as stormwater management facilities. The summaries propose that there will be community input to complete these projects as design work progresses. The Boone Boulevard Green stormwater infrastructure project, described earlier, is one of the four projects. This project came out from the PNA Study and is shaped by its stormwater goals. However, the community was not directly involved in developing this plan.

The current outputs for the Boone Boulevard project include the *Boone Boulevard Green Infrastructure Conceptual Design* and *Proctor Creek's Boone Boulevard Green Street Project Health Impact Assessment.* The conceptual design document includes the conceptual layout, green stormwater infrastructure sizing, stormwater control measures, technical specifications−soils and size of planter boxes, and the estimated project costs. The health impact assessment (HIA) document states that "This HIA is informing DWM's decision on implementing the proposed Green Street Project as they move forward in the planning process." The document also states that "The HIA Core Project Team conducted the HIA with input and guidance from community residents and an HIA Technical Advisory Group, which was made up of representatives from several stakeholder groups."

As mentioned earlier, *student generated conceptual green stormwater infrastructure plans for AUC campuses* were prepared as a way to make progress on dealing with runoff from those campuses. A technical professional, who is also a community activist, worked with students to develop these concepts said, “Basically, they're conceptual plans. They are to call people's attention to the possibility.” While these are written ideas, with community local knowledge input, it can be seen as similar to the PNA Study document if actions proceed towards working on those ideas.

The output of the visioning process is the document with the most apparent direct community input. Since the other documents generated thus far were in part influenced by the study, it can be noted that community participation had indirect roles in the development of those plans. As more plans move from ideas, to conceptual then final design plans, there are proposed community engagement strategies throughout the development processes. Currently, the community had roles in improving the quality of technical decisions by encouraging and advocating for alternative stormwater management plans, other than solely traditional infrastructure solutions.

Implementation Description

In this section I describe the stages of implementation, likelihood of implementation and implementation influencing factors for green stormwater infrastructure. There is a limited understanding in the links between collaborative planning and implementation (Koontz & Newig, 2014). This work addresses that gap by recognizing specific elements of the participation process and the context that influence implementation. Community participation is embedded within collaborative efforts in this case context. The findings in this section answer the third research question:

> How do context features and community participation processes influence implementation of green stormwater infrastructure solutions?

To answer this research question, participants were asked "What factors do you believe will move green stormwater infrastructure implementation forward?" and "how can the community be a part of moving green stormwater infrastructure forward?" Generally, participants responded that the community's role was being educated on green stormwater infrastructure. Education on the subject is necessary to contribute to buy-in and also for educating elected officials who represent community residents. Concerning factors to move implementation forward, participants mentioned factors other than participation such as funding and politics as the main driving forces. Findings from Koontz & Newig (2014) support these findings. They found that "linking funding to the collaborative plan recommendations is an important means to foster implementation.., but even without such a link, the process of collaborative planning can promote networks,

coordination, and buy-in that promotes implementation, even if the plan itself is not directly influential" (p. 436).

Stage of Implementation

The *PNA Study* (p. 14) reports that "It is expected that the proposed PNA project will take up to twenty years to implement fully." The PNA document was published in 2011. From the current implementation trend of green stormwater infrastructure demonstration projects, that statement appears to hold true, if all the projects in the study are even feasible and implemented without major delays. This section gives insight to the current stage of implementation of projects in Proctor Creek watershed, the likelihood of conceptual projects, and the influencers of project implementation as found in the data.

There are two completed green stormwater infrastructure demonstration projects, including Vine City Park and Lindsey Street Park previously described. The small 1.2 acre Lindsey Street Park was very resource intensive in terms of time and expense especially for land acquisition. These two completed projects show that green stormwater infrastructure has reached to stage four of the implementation, which is "actions taken on the ground" (Beierle & Cayford, 2002 p. 56). The final stage would be to see the changes in water quality and runoff quantity, which was observed in its preliminary stage by an interviewee who worked on the project. However, continuous monitoring over a few years will determine the project's effectiveness for water quality, thus limiting the study of outcomes for this research. When asked about the impact of green stormwater

infrastructure strategies at the park, the interviewee, a young community resident who worked on the project responded,

> "Oh yes, this is my favorite part. The water no longer builds up on our street because, where the park is located, there's actually a hill that comes down all of it. So when it rains, that water is traveling in one direction and that's right there near the park. And now that we have that bioswale that actually catches and filters the water, we have less water build up now. That water has somewhere to go and is actually being filtered before it's released to the creek."

Planning and design progress is taking place for the projects that are mentioned in the *Upper Proctor Creek Watershed Action Plan: A waterway on the rebound* document prepared by the City of Atlanta Department of Watershed Management. Published in February 2016 it states (p. 8):

> "Design is under way four each of the four projects, with construction scheduled to begin as early as 2016 and completed by the end of 2017. Input from the community will be gathered as project designs continue and before construction begins."

The four projects include the Boone Boulevard Green Street, Mims Park Pond, Westside Park Pond and Proctor Park, stormwater projects that feature green stormwater infrastructure technologies. Beyond these, there are several more projects that remain at the conceptual level.

Likelihood of Implementation and Influencing Factors

One interviewee was asked about the likelihood of implementation, in reference to student conceptual plans generated for the AUC campuses. As previously mentioned, the students' conceptual plans are "to call people's attention to the possibility." They currently remain conceptual plans, but are being presented to groups that are "all onboard to try to make some of this stuff happen for Proctor Creek" according to the interviewee. Thus, the likelihood of implementing them was uncertain according to the technical expert and community activist, who is from a community non-profit organization. He mentioned:

> "Very supportive of the idea is the fact that we have some 16 federal agencies and other foundations, corporations, and NGOs. All onboard to try to make some of this stuff happen for proctor creek. I believe that this process will proceed in a piecemeal fashion, probably taking as long as 20 years.
>
> Because all we have are the conceptual plans. They still have to go through the whole business of detailing the sizes of the cisterns and green ways.
> We think they will eventually come on board. If we can get to the point where we're ready to begin implementation of all that stuff, cost/benefits analysis, detail analysis of the hydrology and all that in the next two years that would be a big deal."

These inter-organizational and political networks provide strong implementation avenues (Koontz & Newig, 2014; Margerum, 2011).

Subsequent interview questions gave insight into the likelihood of implementation as it relates to factors other than community participation. Interviewees were asked "what are some factors do you think it will take to advance green stormwater infrastructure implementation in Proctor Creek?" All those who were asked mentioned factors mostly

unrelated to community participation. However, the participation aspect interviewees referred to was the need for educating the public on green stormwater infrastructure, a process that has begun to take place through the green stormwater infrastructure forums and conference held. Also mentioned was that implementation for future demonstration projects can build from the levels of trust achieved and capitals achieved during past community participation processes. However, this only is possible if a majority of participants continue to participate in subsequent processes.

Project feasibility is a major factor especially for projects like this containing several technical variables. For example, in this case, sites may not be feasible for certain green stormwater infrastructure technologies even though initially included in the *PNA Study*. During the visioning process, the *PNA Study* (p. 34, 45) reported that the PNA design team−after site assessments and community input−selected potential project sites. One technical factor necessary to consider is soil suitability to promote runoff infiltration. In September 2015, a U.S. EPA team from the Office of Research and Development did soil assessments at potential green stormwater infrastructure sites to test the suitability of soils by its infiltration rates. Results from those tests are to inform and guide green stormwater infrastructure use. An example of a non-technical factor is the issue of land acquisition. Land titles were difficult to trace and contributed to the lengthy process for the land at Lindsey Street Park.

Federal partnerships and partnerships among organizations are linked to the availability of funding and resources. For instance, since the Urban Waters Federal

Partnership began, there has been resource allocation for capacity building, community engagement and other programs. Also, recall that the conceptual design work for the Boone Boulevard Green Street was funded by an Urban Waters grant from the EPA. That project is now on track to completion. Political will strongly influences whether or how quickly a project is finished. In addition, regulatory controls and ordinances can dictate the type of projects that are implemented. On the local level, one interviewee gave an example:

> "If the Mayor, any Mayor, says I want this done and I want it done before the soccer stadium opens in October 2017…And you know people just start doing stuff. It's because we work for the Mayor. There's a political push, there's a bureaucracy, and you think you're doing the best thing based on your technical skills and there's not always the right type of communication that happens."

These implementation influencing factors mentioned here are not comprehensive but highlight the most apparent ones that were found in the data.

Summary of Findings and Discussion

The evidence collected for this case presents the role of community participation in the development of green infrastructure for stormwater management. The analysis and interpretation provide the framing for a socio-technical view for green stormwater infrastructure. Social contexts especially influence process dimensions, characteristics and outputs, which affect the implementation of infrastructure.

Frameworks in the literature describe unidirectional interaction from context to process (Sabatier et al., 2005), or participation process within the context (Luyet et al., 2012). In this case, the links between context and process are apparent, and so is the interrelationship between context and implementation. Collaborative efforts and partnerships build civic community conditions including human, social and political capital through community participation processes. Context variables, in particular social conditions, were considered and accounted for mechanism choices, the flow of the processes. For instance, recall that social conditions dictated community priorities during participation processes. Thus, addressing the prevailing social conditions can play a vital role in creating more efficient participation processes for green stormwater infrastructure. The multilayered benefits of green stormwater infrastructure can create stronger feedback by simultaneously addressing multiple goals and priorities for both context and participation processes.

This work considers education and capacity building as part of the participation process. Through these processes, residents not only gained knowledge but also had the opportunity to contribute their local knowledge to discussions. They were consulted for

their input and empowered in some cases with decision making. Education on green stormwater infrastructure allowed for community buy-in and advocacy for green stormwater infrastructure, and this education is expected to have greater impact for future implementation.

Analysis and interpretation of the results describe a probable causal link between context variables and implementation. Government involvement through funding and collaborative partnerships that facilitate political leverage, provide strong avenues for increasing implementation feasibility. Community participation processes that capitalize on these networks influence implementation. Furthermore, the analysis of the results shows relationship between the process of educating the community on green stormwater infrastructure and the influence on implementation. Buy-in and educating elected officials are also driving forces behind implementation. The outcome link is represented by a dotted line because outcomes of implemented and proposed projects will take several months, and years to truly recognize. The scope of this research does not include the realized outcomes. A longitudinal study would be able to show and confirm that causal link.

To summarize, the most salient findings from this study are listed below.

1. The context attributes interact especially through the influence of civic community conditions. Collaborative community partnerships help to build social, human, and political capital while addressing issues such as the ecological issues, flooding and

stormwater management, and socioeconomic conditions. Community participation in this case is embedded in collaborative partnerships.

2. Education on green stormwater infrastructure goes beyond simply informing participants about the issues and project alternatives. Education and capacity building is a crucial part in the participation process to gain useful input for technical projects. It improves the process, creates a more informed public, leverages local knowledge and addresses public perception challenge of using green stormwater infrastructure.
3. Social conditions highly influence the participation processes by dictating the priorities the community develops during participation processes. For example, socio-economic conditions play a role in understanding the characteristics of participation mechanisms and the levels of participation involved.
4. Factors such as funding and political will promote green stormwater infrastructure more so than community participation. Context factors including government involvement and collaborative partnerships have direct influence on availability of funding and help to facilitate political will respectively. However, community participation plays a role in implementation through processes to educate the community, thereby increasing buy-in for green stormwater infrastructure and facilitating community education towards elected officials.

CHAPTER SIX

CONCLUSION

The purpose of this research was to understand the role of community participation in green stormwater infrastructure development. The findings and discussion were presented in the previous two chapters, and this chapter focuses on the contributions of the findings, and its implications. The chapter concludes with a discussion of future research recommendations.

Research Contributions

The findings suggest that community participation for green stormwater infrastructure is supported by collaborative approaches to community participation in planning, design and implementation. Also, it suggests a greater focus is needed in the educational aspect of participation processes for green stormwater infrastructure. The infrastructure's technical nature requires that a base level understanding of the topic is achieved to have effective and meaningful participation. Additionally, implementation is encouraged by educating the community on the issue, along with other influencing context factors.

Mainly, this work contributes to the further expansion and generalization of public participation theory. Descriptive explanations of context, community participation processes, and implementation for green stormwater infrastructure development extend the use of public participation literature. For instance, this work affirms Beierle's (1999) social goals of public participation in environmental decisions especially with respect to

incorporating public values into decisions, and educating and informing the public. Theories from Sabatier et al.'s (2005) framework are also supported by the findings. For instance, upon examining civic community conditions such as levels of trust and social capital for this study, it was found that it corresponds with Leach & Sabatier's (2005) work that reveal the importance of trust and social capital for partnership agreements. Additionally, the existing literature that reveals the influence of socio-economic conditions on aspects of participation processes are affirmed in this study as described in the previous chapter.

With respect to the growing green stormwater infrastructure literature, this work addresses the gap in literature by examining its community participation aspect. Additionally, this study provides a representative case for community participation in green stormwater infrastructure planning and implementation. However, this case's specific contexts such as a high percentage of African Americans residing in the study area, and low-income levels must be considered for transferring insights from this case; such context factors are shown to influence participation processes. Still, the attributes explored and examined in this case can be studied for other similar cases, especially with respect to their interactions depicted in Figure 2.3 and explained in the previous chapter.

Implications of Research

Insights from this work can inform frameworks for community participation and engagement for green stormwater infrastructure projects in urban areas. For instance, part of the City of Atlanta's plan for green stormwater infrastructure implementation is to develop a framework for outreach and community engagement. This work gives a comprehensive understanding of a case which can be used to inform these efforts, especially in this research's case study area. Similarly, insights can be used in other urban areas to improve participation processes by capitalizing on case context features such as collaborative community partnerships.

Furthermore, a second implication is supporting and enhancing the resources of community organizations and partnerships. Federal, state and local government agencies can provide funding through grants to support collaborative partnership efforts. These efforts have been shown to facilitate more effective participation processes that build social, human and political capital. It is also necessary to contribute to avenues for capacity building so that communities are better equipped to solve problems in their area.

Within design and engineering practice, one implication is to better understand social constraints. Understanding social conditions, like the ones explored in in the context theme of this research, can help to encourage designs that solve multiple problems simultaneously. For instance, green stormwater infrastructure can be used to create community amenities while fulfilling stormwater objectives and performance goals. Thus, designs can address social constraints as well. Traditionally, engineers are

adept at technical challenges while considering costs, and more recently, environmental constraints. However, much more work is needed to develop the consideration of social constraints.

Within engineering education, findings from this work can be incorporated into educational materials for civil engineering classes to show relevance of community participation for stormwater infrastructure projects. This can complement engineering education in that it can broaden students' perspectives about engineering approaches to civil infrastructure. Most students gain an understanding and practice the engineering design process throughout their education. They are trained to solve problems with defined constraints, and to apply similar techniques to different problems. Though this is a necessary component of engineering education, students also need to understand that they are being trained to address societal needs rather than impose solutions.

Recommendations for Future Research

Further research can build from the descriptive and causal analysis to measure how much case context factors influence participation process features and implementation through regression analysis. Similarly, another study can measure how much participation process variables influence implementation. This approach would use multiple regression analysis to analyze factors that relate participation process variables to likelihood of implementation, while measuring other factors that influence

implementation as well. Having numeric values of influence can contribute to a variety of model building techniques, for example, systems dynamics and agent based modeling.

Another avenue for future research involves using social network analysis to investigate the relationships among stakeholders in collaborative efforts for decentralized water infrastructure. This work has value to inform and improve planning and design processes that incorporate a range of stakeholders, which is now more common for decentralized water infrastructure. To quantify and qualify the impact of collaborative decisions, implementation outcomes can be measured through investigating technical performance of water systems.

One straightforward avenue to extend this research is to include additional case studies with similar context features for multiple case study analysis. Cases can be compared holistically or with embedded units of analysis. If done considering embedded units, the units of analysis would be green stormwater projects and would be chosen based on the scale and the size of the project.

APPENDICES

Appendix A

Informed Consent

Information about Being in a Research Study
Clemson University

Understanding the role of community participation in design decisions for stormwater management

Description of the Study and Your Part in It

Leidy Klotz, along with Nicole Barclay, is inviting you to take part in a research study. Leidy Klotz is an associate professor of Civil Engineering at Clemson University. Nicole Barclay is a graduate student at Clemson University, running this study with the help of Leidy Klotz. The purpose of this research is to understand the influence of community participation for infrastructure decisions between green and traditional infrastructure with respect to stormwater management.

Your part in the study will be to respond to interview questions. It will take you about 30 minutes to be in this study. Interviews will be audio recorded and the recordings will be destroyed when the analysis for the study is complete.

Risks and Discomforts

We do not know of any risks or discomforts to you in this research study.

Possible Benefits

We do not know of any way you would benefit directly from taking part in this study. However, understanding the role of community participation can lead to more informed investments in this area, and subsequently encourage more green stormwater infrastructure decisions for stormwater management.

Protection of Privacy and Confidentiality

With your permission, we would like to include your name in our research reports and writings subject to publication.

If you prefer that we keep your identity private, we will do everything we can to protect your privacy and confidentiality. We will not tell anybody outside of the research team that you were in this study or what information we collected about you in particular.

Choosing to Be in the Study

You do not have to be in this study. You may choose not to take part and you may choose to stop taking part at any time. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study.

Contact Information

If you have any questions or concerns about this study or if any problems arise, please contact Leidy Klotz at Clemson University at 864.656.3326.

If you have any questions or concerns about your rights in this research study, please contact the Clemson University Office of Research Compliance (ORC) at 864-656-6460 or irb@clemson.edu. If you are outside of the Upstate South Carolina area, please use the ORC's toll-free number, 866-297-3071.

Consent

I have read this form and have been allowed to ask any questions I might have. I agree to take part in this study.

All information that is obtained with this study and that can be identified with you will remain confidential unless you agree to disclosure of your identity or as required by law. Please indicate if your name may be used in publications or presentations by selecting one of the options below:

____ You MAY use my name in research reports and writings subject to publication.

____ You MAY NOT use my name in research reports and writings subject to publication.

Participant's signature: _____Date: _____

Appendix B

Interview Protocol

Background

1. Can you tell me about your background?

   Probe questions:

   i. How long have live in this neighborhood?

   ii. What organizations are you a part of for Proctor Creek efforts/what is your role in this organization?

   iii. How long have you been involved?

Context

1. Can you describe some of the problems related to stormwater management and infrastructure?
2. How have different groups been working with the community to address challenges?

   Probe questions:

   i. Have you seen issues of conflict/different agendas?

   ii. Can you tell me about the levels of trust within the community towards different organizations/government institutions?

Process

1. Tell me about your experience during the _____ participation process.

   Probe questions:

   i. Do you think that the community's concerns were addressed? Can you elaborate?

2. Can you tell me about the PNA Study?

   Probe question:

   i. Do you think the community's ideas and contributions were represented in the final document? Can you elaborate?

3. What efforts have there been for capacity building and education for community residents?

   Probe question:

   i. Can you describe further?

4. What are the issues with getting community members to participate?

Outputs

1. What documents and decisions have been made for green stormwater infrastructure development in Proctor Creek neighborhoods?

Implementation

1. What factors do you think it will take to advance green stormwater infrastructure in Proctor Creek?
2. What do you think is the role of community participation in green stormwater infrastructure implementation?

Wrap-up Questions

1. Is there anything else you would like to add?
2. Who else would you recommend I talk to?

Appendix C

List of Documents

1. *Proctor Creek North Avenue Watershed Basin: A Green Infrastructure Vision* – prepared by Park Pride
2. *Boone Boulevard Green Infrastructure Conceptual Design* – prepared by City of Atlanta, Department of Watershed Management
3. *Proctor Creek's Boone Boulevard Green Street Project Health Impact Assessment* – prepared by the EPA
4. *Proctor Creek – Headwaters to Chattahoochee River: Watershed Improvement Plan* – prepared by Atlanta Regional Commission
5. *Visioning for Green Infrastructure* – prepared by ECO-Action
6. *Upper Proctor Creek Watershed Action Plan: A waterway on the rebound* - prepared by the City of Atlanta Department of Watershed Management.
7. *Proctor Creek Problems* – prepared by the EPA
8. *Proctor Creek Community Engagement 3-Step Plan* – prepared by the EPA
9. *Proctor Creek Final Fact Sheet – Making a Visible Difference* – prepared by the EPA
10. *Partners for progress in Proctor Creek: Recreating a Sustainable Creekside Community in the City, The Urban Waters Federal Partnership* – prepared by the EPA

11. *Implementing Green stormwater infrastructure: Atlanta's Post-Development Stormwater Ordinance* – prepared by City of Atlanta, Department of Watershed Management
12. *City of Atlanta: Green Infrastructure Strategic Action Plan* – prepared by the City of Atlanta
13. *AUC Green Infrastructure Community Forum Agenda: Spelman College, Atlanta* – prepared by ECO-Action
14. *Green Infrastructure Curriculum Guide: A Resource for Infusing Green infrastructure into AUC Coursework*
15. *ECO-Action Hosts First Green Infrastructure Community Forum at Spelman* – prepared by ECO-Action
16. *AUC and Community Together Promote Green Infrastructure at Community Forum 2* – prepared by ECO-Action

Appendix D

Codebook

Context		
Attribute/Code	**When to use**	**Brief Definition/Explanation**
type of issue	flooding conditions; stormwater management issues	describes the case situation and its characteristics
ecological conditions	issues of water quality; stream hydrology	characterized by issues that deal water quality, stream hydrology, hydrological processes, species variation
socioeconomic conditions	income, education status, employment	the general income levels, education status, and occupations in the case community
government-institutional settings	government involvement	interacting government agencies at the federal, state and local levels
civic community conditions	human capital	"the native intelligence, skills, abilities, education, and health of individuals within a community" (Flora, 2004 p. 8)
	social capital	"community characteristic based on the interactions among individuals and groups. Includes mutual trust, reciprocity, collective identity, cooperation and a sense of a shared future" (Flora, 2004 p. 9)
	political capital	"Political capital is the ability of a community to influence the distribution of resources and to determine which resources are made available influence the distribution of resources and to determine which resources are made available" (Flora, 2004, p. 10)
	levels of trust	participant trust in government agencies and stakeholders holder groups
	issues of conflict	pre-existing issues of disagreements

Process		
participation mechanisms	participation mechanisms	the method that facilitates participation processes and the level of participation
characteristics of mechanisms	description of participants	characteristics of participants
	type of output	product generated from participation process
	goal of process	objectives to be accomplished during the process
Attribute/Code	**When to use**	**Brief Definition/Explanation**
Output		
decisions and plans	decisions recorded in plans and documents	describes recorded contribution, decisions, and plans
Implementation		
stage of implementation	describes stage of implementation	point in the process of implementation
likelihood of implementation	describes likelihood of implementation	prospect of implementation
implementation influencers	implementation influencing factors	factors that have an impact on implementation outcomes

Appendix E

Data Reference Counts

Table 7.1 presents a summary of number of coded sources and references for the theoretical constructs of this case which were used as the codes for this case. All codes are not considered to be equal. For example, the type of issue was not necessarily more important than the ecological conditions. This table is included to show the representativeness of the attributes in the data.

Table 7.1: Summary of reference counts for coded data

Theme	Attribute	Number of sources referenced	Number of references
Context	Type of issue	20	47
	Ecological conditions	10	16
	Socioeconomic conditions	6	16
	Civic community conditions	8	21
	Government-institutional settings	12	23
Process	Community Participation and Collaboration	18	62
	Type of mechanism and Characteristics	12	43
	Issues of non-participation	9	13
	Motivation for participation	6	10
	Education and Capacity Building	18	57

Output	Decisions and Plans	10	27
Implementation	Stage of Implementation	10	31
	Likelihood of Implementation		
	Forces other than public participation influencing implementation		
	Stormwater Control Objectives & Performance Goals		

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